HIGHWAY PROGRESS

Annual Report of the Bureau of Public Roads Fiscal Year 1961

This section of Interstate Route 26 in South Carolina, between Clinton and Orangeburg, is part of a 98-mile continuous stretch open to traffic

U.S. DEPARTMENT OF COMMERCE

Annual Report of the

Bureau of Public Roads

Fiscal Year 1961

HIGHWAY PROGRESS 1961

UNITED STATES DEPARTMENT OF COMMERCE

November 1961

U.S. DEPARTMENT OF COMMERCE

LUTHER H. HODGES, *Secretary*

BUREAU OF PUBLIC ROADS

REX M. WHITTON, *Administrator*

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Acknowledgment is made of the courtesy of the State highway departments in furnishing the illustrations used in this report.

This project on Interstate Route 4 in Orlando, Fla., included a pedestrian overpass providing access to a school.

HIGHWAY PROGRESS

ANNUAL REPORT OF THE BUREAU OF PUBLIC ROADS

Summary Review of the Fiscal Year

THE fiscal year 1961[1] saw continuing vigorous progress in the expanded nationwide highway improvement program inaugurated by the Federal-Aid Highway Act of 1956. Largely as a result of 5 years of concerted effort by the States and the Bureau of Public Roads, motorists were traveling on some 10,800 miles of the Interstate System, both in cities and in rural areas. Extensive improvements had also been made on other major highways and arterial streets and on America's vast secondary road mileage, in the long continuing regular Federal-aid programs begun in 1917.

The total mileage of all roads and streets in the United States, 3.5 million miles, is no longer growing extensively, but great strides are being made in the improvement of their quality and capacity.

Capital expenditures by all levels of government in the United States on all roads and streets, for engineering, right-of-way, and construction, were estimated at $6.3 billion in the calendar year 1960 and were expected to total $7.0 billion in 1961.

Highway use continued to break past records. Motor-vehicle registrations were expected to reach 76 million in calendar year 1961 and travel was forecast at 733 billion vehicle-miles, a gain of over 2 percent in each case. In calendar year 1960 motor-vehicle registrations had totaled 73.9 million and travel amounted to 719 billion vehicle-miles.

Federal-aid funds obligated for surveys and plans, right-of-way acquisition, and construction totaled $3.187 billion during the fiscal year 1961, a gain of 22 percent over the $2.611 billion obligated in the previous year.

Apportionment was made to the States on July 22, 1960, of Federal-aid funds authorized for the fiscal year 1962, including $2.2 billion for the Interstate System and $693.75 million for the Federal-aid primary and secondary highway systems and their urban extensions (the so-called ABC program). Because population is one of the elements involved in apportioning ABC funds among the States, and final 1960 Census figures were not yet available, only 75 percent of the ABC authorized funds were apportioned at that time. The remainder of the $925 million authorized was apportioned among the States on December 30, 1960.

The total of Federal-aid funds apportioned since passage of the 1956 Act, which launched the accelerated highway program, was thus brought to $16.4 billion.

During the year reports on the highway cost allocation study and a new estimate of the cost of completing the Interstate System were completed by Public Roads and presented to the Congress. These, followed by an urgent highway message from the President and extensive hearings in the Congress, led

[1] The fiscal year extended from July 1, 1960, through June 30, 1961.

to passage of the Federal-Aid Highway Act of 1961, approved on June 29, the fifth anniversary of the 1956 Act. The new legislation assured completion of the Interstate System on schedule by 1972.

Accomplishments of the year

During the year, projects were programed in the Federal-aid and Federal highway programs for the construction of 24,847 miles of improvements. Contracts were awarded during the year for improvements to 23,017 miles of roads and streets. Construction put in place during the year involved $2.783 billion of Federal funds, an increase of 2 percent from the record of the previous year.

Completions of all classes of Federal-aid and Federal projects during the fiscal year provided improvements on 23,127 miles of roads and streets. Included were 22,083 miles of highways and 6,148 bridges on the Federal-aid systems and 1,044 miles of roads in national forests, parks, and parkways, and on flood-relief and access-road projects.

Hazards at railway-highway grade crossings were removed during the year by elimination of 361 grade crossings, reconstruction of 18 inadequate grade-separation structures, and protection of 389 crossings by installation of flashing lights or other safety devices. These figures include the separation or protection of crossings encountered on new highway locations.

The linear mileage of highway improvements completed is not a full measure of the facilities provided for traffic. Capacity and safety and riding quality are all improved by application of the knowledge gained by experience, observation, research, and development. More and more highways were constructed with better alinement, flatter curves and grades, and smoother and wider pavements. The Interstate and some of the other Federal-aid projects completed during the year had access control and grade crossings eliminated. Generally they were four or more lanes wide, replacing old roads with only two lanes. The 22,083 miles of Federal-aid projects completed during the fiscal year 1961 included 3,849 miles of 4-lane highways and 277 miles having 6 lanes or more. Thus the year's Federal-aid project completions provided the equivalent of 52,971 miles of single-lane construction.

At the end of the fiscal year, construction was underway or plans had been approved, in the Federal-aid program, for improvements on 32,375 miles of roads and streets. Included were construction of 10,986 bridges and the elimination, reconstruction, or protection of 1,451 railway-highway crossings. The estimated cost of this work was $9.3 billion, of which $6.9 billion was Federal aid.

In addition, at the close of the year, the programs for construction of national forest, park, and public lands highways, defense-access roads, and flood-damaged roads and bridges, included improvements underway on 2,337 miles, at a total estimated cost of $169 million including $161 million of Federal funds.

Accomplishments of the year on the several Federal-aid systems and in the Federal lands highway programs, and detailed information on other subjects, will be found in individual presentations in other sections of this report. Supporting statistics, both in summary and detail, appear in the appendix tables.

The Interstate System

Progress on the 41,000-mile Interstate System continued to be the center of public interest. At the end of the fiscal year, 10,825 miles of the System were open to traffic, of which 5,550 miles were complete to standards needed for fully serving traffic in 1975. In addition, 4,847 miles were under construction. Motorists and truckers across the Nation were experiencing the great advantages of these controlled-access freeways. Industrial, commercial, and residential development was being attracted to locations adjacent to the Interstate right-of-way.

The new estimate of the cost of completing the Interstate System, made during the year, reaffirmed the 1958 estimate of $41 billion as the overall cost of building the System. Of this total, the Federal share is $37 billion.

Federal-aid financing

The difficult financing situation described in last year's report was completely resolved by passage of the Federal-Aid Highway Act of 1961. The legislation, accepting the validity of the 1961 cost estimate for the Interstate System, increased the Federal-aid Interstate fund authorizations over the next decade so as to provide a total of $37 billion for the 1957–72 period during which the System was originally scheduled to be completed. The additional $11½ billion thus provided over the original total authorization assured completion of the System by the target date.

The 1961 act also provided for the needed additional revenue in highway-user taxes. The 4-cent per gallon motor-fuel tax was continued, tax rates on tires and tubes and on heavy vehicles were increased, and all of the tax on new trucks and buses (instead of just half) was dedicated to the highway trust fund beginning July 1, 1962.

Construction contracts and prices

The Federal-aid highway construction program is accomplished under the traditional American practice of competitive bidding for contracts let by the States. Competitive bidding during the fiscal year was generally quite spirited, averaging 6.8 bids per contract.

During the fiscal year, 6,644 Federal-aid construction contracts were awarded, of which 3,674 were on the primary system and 2,941 on the secondary system. These totals include 628 miscellaneous Federal-aid highway contracts covering such work as demolition of buildings, landscaping, and storm drainage. Forty-seven percent of the primary system contracts were for Interstate System projects. Contracts for urban work were also included in the total for the primary system. Successful bidders on Federal-aid primary contracts averaged 1.75 contract awards each.

The average size contract was $467,500, and 91 percent of the contracts were for less than $1 million.

The trend of stabilization in highway construction bid prices, which began in the second quarter of fiscal year 1957, continued throughout fiscal year 1961. The composite index for the first quarter of fiscal year 1957 was 167.2 (1925–29 average=100) which was 11.9 percent above the low point of 149.4 at the end of fiscal year 1955. The composite index for the fourth quarter of fiscal year 1960 was 159.1 which was 6.5 percent above the same low point. The index for the fourth quarter of 1961 was 160.0, resulting in a net increase of 0.6 percent during fiscal year 1961. Work was underway on revision of the weighting structure of the highway construction bid price index, from the old 1925–29 base period to a new 1957–59 base.

Highway construction average hourly earnings increased 3.2 percent during fiscal 1961, but as a result of continually improving productivity in highway construction, the cost of labor actually decreased 0.8 percent. The cost of highway construction materials dropped 2.1 percent, but equipment ownership costs rose 0.5 percent during the year. The weighted average decrease of highway construction labor, materials, and equipment ownership costs was 1.0 percent, identical with the decrease during fiscal year 1960.

Federal-aid highway construction, during fiscal year 1961, utilized approximately 275 million man-hours of labor, 1.6 million tons of steel, 50 million barrels of portland cement, 3.9 million tons of bituminous materials, and 295 million

tons of aggregates. Excavation on Federal-aid highway construction, during the fiscal year, amounted to about 1.25 billion cubic yards.

Research

Public Roads, with its own staff and in cooperation with the State highway departments and others, continued to carry on an extensive program of research in a wide range of fields related to highways and transportation. A major accomplishment of the year was the completion (except for one phase) of the highway cost allocation study. At the AASHO Road Test, in which Public Roads was collaborating with the States and others, the field work was completed during the year. In the 2 years of operation, the test vehicles had traveled 17 million miles. Analysis of the millions of bits of data scientifically collected was underway.

Administration

Bertram D. Tallamy, who had been nominated for the newly created position of Federal Highway Administrator shortly after the accelerated Federal-aid program was launched in 1956 and who officially assumed that position on February 5, 1957, resigned on January 19, 1961. He was succeeded as Federal Highway Administrator by Rex M. Whitton, long-time chief engineer of the Missouri State Highway Commission and past president of the American Association of State Highway Officials, who took office on February 10, 1961.

Ellis L. Armstrong, who had served as Commissioner of Public Roads since October 13, 1958, also resigned on January 19, 1961. At the close of the fiscal year legislation was being recommended by the Department of Commerce to the Congress to abolish the position of Commissioner and to create in its stead the position of Deputy Highway Administrator.

Effort continued during the year in the improvement of Public Roads' administrative and financial programs, and an appraisal of manpower needs and utilization was begun. Examination of Federal-aid operations was conducted in 11 States, and a number of investigations were made into allegations of irregularities or malpractices in the highway programs.

Interchange on Interstate Route 74 and U.S. 45 at the outskirts of Champaign-Urbana, Ill.

The Special Subcommittee of the Public Works Committee of the House of Representatives, headed by Congressman Blatnik, held hearings in December 1960 on alleged irregularities in the highway program in Florida; in particular, the relationships of State highway department employees with highway contractors. Hearings of this special subcommittee were also held in March 1961 on the subject of disposal of right-of-way improvements and in June 1961 on the highway program in New Mexico. Public Roads provided technical assistance to the committee on these and other matters.

Development of the Federal-Aid Program

For those unfamiliar with the history and operation of the Federal-aid program, a brief account follows.

Federal aid to the States for highway improvement had its modest beginning in the Federal-Aid Road Act of 1916. Through the years, without interruption except in World War II, the program has continued to grow in size and importance commensurate with the explosive growth of motor-vehicle transportation in the United States. For almost two decades, use of Federal aid was restricted to rural portions of what now constitutes the Federal-aid primary highway system, an extensive network including most of the country's main-traveled roads. Since 1934 Federal aid has also been extended to the urban portions of this system, and since 1944 to a Federal-aid secondary highway system of farm-to-market roads.

In 1944 also, the National System of Interstate and Defense Highways was brought into being. This Interstate System, as it is commonly called, is limited to 41,000 miles in extent, and constitutes the most important portions of the Federal-aid primary system. Federal-aid funds, however, were not specifically authorized for the Interstate System, or were provided only in relatively modest amounts, until 1956.

The Federal-Aid Highway Act of 1956, augmented by the Federal-Aid Highway Acts of 1958, 1959, 1960, and 1961, authorized a tremendously enlarged highway program which, in its entirety, will be the greatest peacetime construction program in history. While extending at an increased rate the traditional aid for primary, secondary, and urban highway improvements, the 1956 act authorized Federal aid over an extended period for completion of the Interstate System. The 1956 act also established a Federal highway trust fund to receive Federal highway-user excise taxes and from which funds for Federal highway aid are disbursed.

The Federal-aid authorizations are made in four categories: For the Interstate System, and for primary, secondary, and urban highways—the latter group are often referred to as the ABC program. Authorizations of Federal aid for the Interstate System total $37 billion, spread over the 15 fiscal years 1957–71. Authorizations for the ABC program, usually made biennially, have risen $25 million annually in recent years, from $825 million for fiscal year 1957 to $925 million in 1962. Federal-aid funds for the ABC program are apportioned among the States according to formulas prescribed by law, taking into account population, area, and postal route mileage. Interstate funds are apportioned among the States on the basis of need, to insure simultaneous completion of the system in all States.

Interstate funds are matched by the States on a 90-percent Federal, 10-percent State basis; the ABC funds are matched 50–50. States with large areas of public lands match on a proportionately reduced scale. Federal aid may be used only for highway improvements, not for maintenance. The program is a cooperative enterprise in which the States have the initiative and responsibility for the

selection, design, and construction of the Federal-aid projects, subject to review and approval of each stage by the Bureau of Public Roads.

As of December 31, 1960, the Federal-aid primary system totaled 265,477 miles in extent, including the Interstate System. There were 601,364 miles in the Federal-aid secondary system. The urban portions of the primary and secondary systems totaled 38,298 miles.

New Federal-Aid Legislation

Early in January 1961 the Bureau of Public Roads completed the highway cost allocation study and the 1961 estimate of the cost of completing the Interstate System, both of which had been requested by the Congress. Reports on both were submitted to the Congress by the Secretary of Commerce. The studies are described in another section of this report.

On February 28, 1961, the President issued a special message to the Congress on highways, including a plan for tax revisions to provide needed additional financing. Early in March 1961, the Ways and Means Committee of the House of Representatives held hearings on the subject of highway financing. These hearings were followed closely by hearings held by the House Public Works Committee on a bill to provide increased authorizations for the Interstate System, as recommended by the President, and by hearings held by the Senate Public Works Committee on the progress of the highway program. After passage of the highway bill by the House, the Senate Finance Committee heard extensive testimony from Government officials and private groups early in June 1961. The result of these actions was passage of the Federal-Aid Highway Act of 1961.

The Federal-Aid Highway Act of 1961

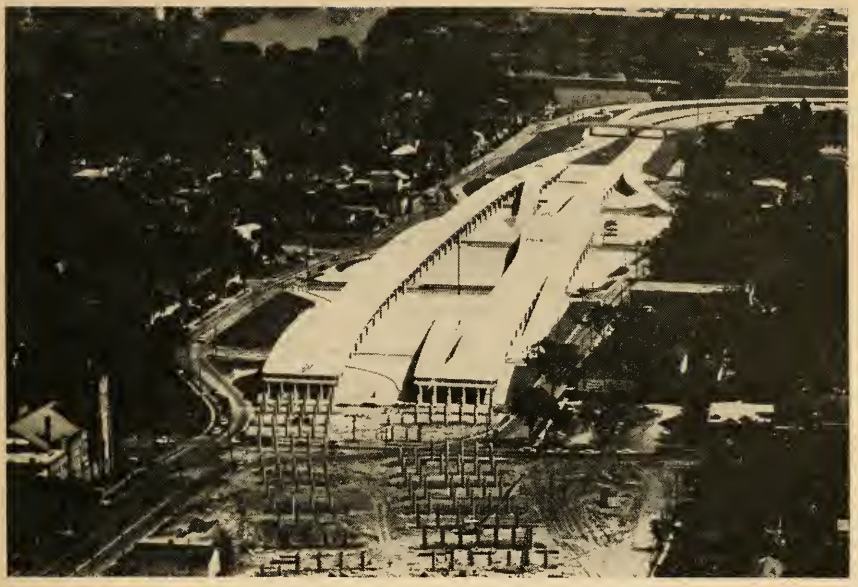
The Federal-Aid Highway Act of 1961 was enacted by the Congress and approved by the President on June 29, 1961. It assures completion of the Interstate System by 1972, on schedule, through increased annual authorizations and additional financing necessary to support them, amounting to about $11½ billion.

Under the Federal-Aid Highway Act of 1956, as amended in 1958 and 1959 (and including a small balance of previously authorized funds), $11.715 billion of Federal funds had already been apportioned among the States for the Interstate System, for the fiscal years 1957–62. The 1961 Act revised the schedule of Interstate authorizations for the future to provide the following: $2.4 billion for fiscal year 1963, $2.6 billion for 1964, $2.7 billion for 1965, $2.8 billion for 1966, $2.9 billion for 1967, $3.0 billion for each of the fiscal years 1968, 1969, and 1970, and $2.885 billion for 1971.

The total of Federal funds thus already apportioned and now authorized for the future is $37 billion, an increase of $11.56 billion over the total previously provided for by the 1956 Act as amended in 1958 and 1959.

The 1961 Act formally approved the new estimate of the cost of completing the Interstate System as the basis for apportioning among the States the Interstate funds authorized for the fiscal years 1963–66. The estimate report indicated the total cost for the 41,000 miles of the System as $41 billion, of which the 90-percent Federal share is $37 billion.

To provide the needed Federal-aid financing over the next decade, the 1961 Act revised the existing schedule of Federal highway-user excise taxes dedicated to the Highway Trust Fund. The motor-fuel tax rate was continued at 4 cents per gallon until October 1, 1972. For the same period, the tax per pound was increased on highway vehicle tires from 8 to 10 cents, on inner tubes from 9 to 10 cents, and on retread rubber from 3 to 5 cents. The use tax on heavy vehicles, those over 26,000 pounds gross weight, was increased from $1.50 to $3.00



This 6-lane elevated expressway is under construction in Baton Rouge, La., as part of Interstate Route 410.

per 1,000 pounds per year. In addition, the 1961 Act provided that, beginning July 1, 1962, and continuing to October 1, 1972, all of the 10-percent excise tax on the manufacturer's sales price of new trucks, buses, and trailers is to go to the Highway Trust Fund. Under the 1956 Act, only one-half of this tax had been dedicated to the trust fund. (The provision of the 1959 Act that part of the excise taxes on new automobiles and parts and accessories be dedicated to the trust fund for 3 years was repealed by the 1961 Act.)

Other provisions of the 1961 Act included an amendment to section 111 of Title 23, United States Code, expanding the uses to which the airspace above and below the Interstate System may be put. The 1961 Act also extended for 2 years the time in which States may enter into agreements with the Secretary of Commerce for the control of advertising on the Interstate System. Under the law as now amended, a State must enter into an agreement regarding the control of advertising along the Interstate System before June 30, 1963, in order to take advantage of the incentive payments or "bonus" provisions of law.

Another section of the 1961 Act authorized the use, under specified circumstances, of funds appropriated for defense access roads to pay the cost of damage caused to highways by the operation of vehicles and equipment in the construction of certain military installations.

The National System of Interstate and Defense Highways

The National System of Interstate and Defense Highways is a 41,000-mile planned, integrated network of the Nation's most heavily traveled routes, linking the country's metropolitan areas and industrial centers, serving the national defense, and connecting with routes of continental importance in Canada and Mexico. Comprising little more than 1 percent of the total U.S. mileage, the system when completed in 1972 will carry over 20 percent of the Nation's traffic.

Status at end of year

The concentrated efforts of the State highway departments, Public Roads, and the contractor, materials, and equipment industries were reflected in the outstanding progress made during the 5 years of the Interstate program's existence. At the end of the fiscal year, 10,825 miles of the Interstate System were open to traffic, and construction was underway on another 4,847 miles.

Of the sections open to use, 5,550 miles were completed to standards adequate for 1975 traffic, the program's objective; and 3,005 miles were improved to full capability for handling current traffic but needed additional improvement to bring them up to the standards for 1975. These accomplishments had been achieved with Federal-aid and other public funds.

In addition, 2,270 miles of toll roads, bridges, and tunnels had been incorporated in the System. Their inclusion is permitted by law, but Federal-aid funds may not be used for their improvement, and they continue to operate as toll facilities.

More than half of the mileage open to traffic, 6,268 miles, had been built or improved under the Federal-aid Interstate program, most of it under the 90-percent Federal, 10-percent State sharing program launched in 1956. Work on the remaining 2,287 miles (other than toll facilities) was financed by the States and localities, mostly before 1956, under other programs—in many cases with Federal aid.

In addition to the sections open to traffic, 4,847 miles were under construction with Federal-aid Interstate funds at the end of the fiscal year, and engineering or right-of-way acquisition was in progress on another 10,052 miles. Thus some form of work was completed or underway on 25,724 miles of the 41,000-mile System—about 63 percent of the total.

The status of improvement of the Interstate System is shown in summary in the table on this page and by States in appendix table 11. A map showing the general location of sections completed or underway appears on pages 54–55.

Status of improvement of the Interstate System as of June 30, 1961

Improvements	Financing with—		Total
	Interstate funds [1]	Other public funds [2]	
	Miles	*Miles*	*Miles*
Improved and open to traffic:			
Completed to full or acceptable standards	4,989	561	5,550
Improved to standards adequate for present traffic but additional improvement needed to meet full standards	1,279	1,726	3,005
Toll facilities	----------	----------	2,270
Total improved and open to traffic	6,268	2,287	[3] 10,825
Improvements underway with Interstate funds:			
Under construction	4,847	----------	4,847
Preliminary engineering or right-of-way acquisition underway	10,052	----------	10,052
Total improvements underway	14,899	----------	14,899
Total completed, improved, or underway	----------	----------	[3] 25,724

[1] Including State matching funds.
[2] Including some Federal aid.
[3] Including toll facilities.

Development of the system

The Interstate System was created, with a 40,000-mile limitation, by the Federal-Aid Highway Act of 1944. General locations of 37,700 miles of intercity

Interstate Route 95, north of Augusta, Maine. The roadside rest area on one side will ultimately be shielded from traffic by recently planted trees. The waste dump area has been seeded and natural growth was preserved as a screen.

routes were officially designated in 1947, and 2,300 miles of routes around, into, and through cities were designated in 1955. Taken into account in the selections, made cooperatively by the States and Public Roads, were the basic factors of population service, transportation requirements of industry, commerce, and agriculture, system integration, and needs of national defense.

The Federal-Aid Highway Act of 1956 provided a 1,000-mile increase in the limitation of the Interstate System; and about that time it became evident, as the States selected detailed locations for the routes of the originally designated 40,000 miles, that considerable mileage saving had resulted from adoption of alinements more direct than those of existing highways. As a consequence, 2,100 miles of additional routes were designated in 1957 within the 41,000-mile limit.

At the end of the fiscal year the designated Interstate System totaled 40,617 miles of which 35,505 were rural and 5,112 were urban. The remaining 383 miles within the 41,000-mile limitation were held in reserve for adjustments as final locations are selected and projects built. The States continued economic and engineering studies to determine the most feasible locations for the Interstate route sections, both for the immediate work of right-of-way acquisition and construction and for the revised estimate of the cost of completing the system, which was underway. At the end of the year definite or feasible locations had been selected by the States and approved by Public Roads for all routes.

Until 1956, only limited amounts of Federal-aid funds were specifically authorized by Congress for Interstate System improvement, although Federal-aid

On Interstate Route 89 in Hopkinton, N.H., independent roadway design provides a high degree of safety and eliminates headlight glare at night. One roadway lies atop a ridge while the other is downhill and across a swale.

primary and urban funds could be and were used to a considerable extent for that purpose. The picture changed radically when the 1956 Act authorized almost $25 billion of Federal-aid funds over the 13-year period 1957–69 for completion of the Interstate System, to be matched on a 90-percent Federal, 10-percent State basis. A much more detailed estimate of the cost of completing the System made in 1958, and confirmed by the 1961 estimate (described elsewhere in this report), showed that the total amount of Federal funds needed would be $37 billion. The Federal-Aid Highway Act of 1961 (also described elsewhere in this report) has provided the necessary increased authorizations and revenue.

Federal-aid authorizations for the Interstate System totaling $9.2 billion, for the fiscal years 1957–61, had been apportioned to the States prior to the fiscal year. The $2.2 billion of Interstate funds authorized for fiscal year 1962 was apportioned to the States on July 22, 1960.

Progress during the year

The details of route selection, making of surveys and plans, acquisition of right-of-way, and construction of projects of the magnitude and complexity involved in the Interstate System often take 3 or 4 years from conception to completion. Many route sections are being built in stages, with an initial project for grading and drainage and a subsequent project for paving. Some existing highways are improved and augmented to attain Interstate standards; for example, by acquisition of access control, or by adding another roadway to a two-lane road, to make a four-lane divided freeway.

Much was accomplished in the Interstate System program during the fiscal year. The mileage of the System completed to full standards was increased by 1,857 miles. The mileage actually in use (fully or partially improved) rose from 9,107 miles at the beginning of the year to 10,825 miles at the close, an increase of 19 percent.

Improvements were programed during the year on 3,420 miles, with an estimated cost of $2.84 billion including $2.41 billion of Federal-aid Interstate funds.

Improvements involving Federal-aid Interstate funds were completed during the fiscal year on 3,017 miles of the Interstate System at a total cost of $1.88 billion, of which $1.61 billion was the Federal share. Completed work included 1,945 miles of bituminous and portland cement concrete surfacing, 1,025 miles of grading, drainage work, and temporary surfacing, and 47 miles of structures involving 712 bridges over streams, 1,701 bridges over highways to provide traffic grade separations, and 155 railway-highway grade-separation structures.

At the end of the year a total of $1,022 million worth of work was in program status, and 4,989 projects with a total estimated cost of $6.0 billion were underway or scheduled to start soon.

Excluding projects that have only been programed, a total of $10.9 billion had been obligated for the Interstate System at the end of the fiscal year, of which 6 percent was for preliminary engineering, 24 percent for right-of-way acquisition, and 70 percent for construction. At the end of the previous year $8.4 billion had been obligated, of which 69 percent was for construction.

Interstate System Progress: Case Histories

Impressive progress is shown by the statistics on the development of the Interstate System during the 5 years since the accelerated program was launched in 1956. Far more impressive to the average motorist or trucker, however, were the many completed sections open to their use, ranging from a few miles to several hundred miles in length. The red-white-and-blue Interstate route marker was increasingly recognized as a beacon signaling swift, safe, tension-free driving. Travelers noted, too, the promise of the future in the big construction jobs they saw underway, although sometimes their patience was tried by detours or delays at construction operations. But the individual driver was apt to know only of Interstate progress in his own locale or along the route of his last vacation trip. A nationwide, close-up picture of progress may be gained, perhaps, by glimpses of typical Interstate projects across the land, completed or underway during the fiscal year. (I– is used to designate the term Interstate Route, with the appropriate number.)

Alabama.—A 46-mile section of I–65 was completed during the year, extending from 20 miles north of Montgomery to 20 miles south of Birmingham. The new route bypasses six small communities where traffic on the old highway was badly congested.

Arizona.—Six miles of the Phoenix Freeway were completed during the year and 3 miles were under construction. This 6-lane, depressed freeway is a major element in the Phoenix City and Maricopa County plan and is a part of I–17, the north-south connector in Arizona between the cross-country routes I–10 and I–40.

Arkansas.—A new bridge carrying I–30 across the Arkansas River was opened to traffic near the close of the year. The $7.3-million structure is the first phase of a planned 6-lane urban freeway in Little Rock and North Little Rock. The two old bridges between these cities were the worst bottlenecks in the State, adversely affecting traffic for 15 blocks on both sides of the river.

California.—A 3.4-mile section of I–5 was completed near famous Mt. Shasta. The project bypasses Dunsmuir, reducing traffic congestion there. The old road, with its sharp turns and steep grades, was always a traffic hazard. The new 4-lane freeway with a 16-foot median has a maximum overall grade of only 2 percent.

Colorado.—Completion of twin tunnels near Idaho Springs provided another link in I–70 through the Rocky Mountains west from Denver into Utah. The

Travelers on Interstate Route 35 in Oklahoma should have no trouble finding their way, with signs such as these.

695-foot long tunnels, each with two 12-foot driving lanes and 16-foot overhead clearance, cost $1.1 million. The old route was narrow and winding, with icy northern exposures. Over 5,400 vehicles a day were using the straight, easy-to-drive route through the new tunnels.

Connecticut.—The three-level interchange between I–84 and I–91 in Hartford was nearing completion at the end of the year. Construction of the $6.1-million project, on the bank of the Connecticut River and adjacent to a railroad line, was complicated by the necessity for handling local and through traffic exceeding 40,000 vehicles a day: nevertheless, work was 12 months ahead of schedule. An oddity of the interchange is that one leg connects to a river bridge built in 1908 while another leg leads to a bridge built in 1957.

District of Columbia.—A 1.7-mile section of the Anacostia Freeway, I–295, was nearing completion. This $3.3-million project connects with the new Woodrow Wilson Bridge spanning the Potomac River south of Washington, D.C. The route will serve as an important bypass of downtown Washington.

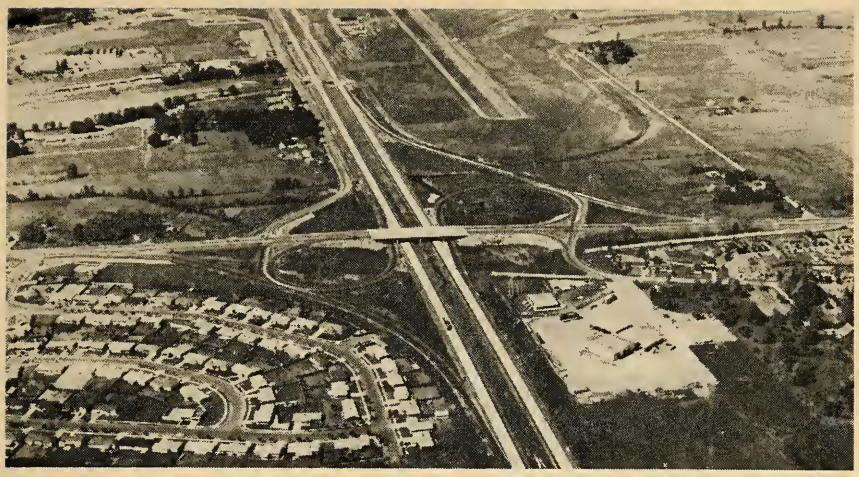
Florida.—Seven projects covering a 27-mile section of I–10 were about to be opened to traffic at the close of the year, in and west of Orlando. The remaining 50 miles of this route to Tampa were under construction and scheduled for completion in September 1961. Traffic of nearly 31,000 vehicles per day is expected by 1975.

Georgia.—A vital 2-mile, 8-lane link in I–75 and I–85, including an interchange with I–20, was under construction in Atlanta. The two routes combine in looping around the east side of Atlanta's central business district. The completed 6-lane section south of this area was carrying 78,000 vehicles per day.

Hawaii.—One of the newly designated Interstate routes is the Likelike Highway crossing the mountains from Honolulu to Koneohe. A 5.8-mile section of the route, completed with Federal-aid funds during the year, includes twin 2,775-foot tunnels.

Idaho.—16-mile section of I–15 between Pocatello and Blackfoot was nearly completed. The cost of the 4-lane divided highway was $350,000 per mile.

Illinois.—A 31-mile stretch of I–74 between Champaign and Danville, including 5 miles in the Champaign-Urbana urban area, was completed early in the year at a cost of $24.7 million. The old route which it parallels, U.S. 150, was scheduled for widening and resurfacing but traffic dropped from 4,000 to 1,000 vehicles per day after I–74 opened, and general improvement of U.S. 150 is no longer considered necessary. I–75 was already carrying up to 6,000 vehicles



Residential and commercial developments benefit from service provided by Interstate Route 5 between Albany and Eugene, Oreg.

daily in rural areas and 9,000 in the urban area, at an average speed of 60 miles per hour as contrasted with less than 40 on the old route. Heavy intra-urban traffic between Urbana and Champaign had developed, even though trip distances were sometimes greater than on city streets. At a conservative estimate of 15 cents saving per trip on this route, direct road-user benefits amount to $325,000 per year. Extensive residential, commercial, and industrial growth was noted along the route within the influence of the urban areas, and land values increased sharply.

Indiana.—Work was underway on I–465, the circumferential highway around Indianapolis, and the seven Interstate routes radiating outward from it. The interchange between I–74 and I–465 was completed during the year and construction was in progress on adjacent projects totaling 15 miles in length.

Iowa.—A 73-mile continuous section of I–35 and I–80 from Osceola north to Des Moines and east to Newton was completed at a total cost of $47 million. The bypass of Des Moines is a great timesaver to the heavy interstate truck traffic across central Iowa, and relieves congestion in the northern part of the city. Savings to traffic on the new 73-mile route, as compared with the old routes, is estimated at $3.5 million annually, enough to pay for the building cost in 13 years. The new route is also generating land development near the interchanges, particularly in the Des Moines area.

Kansas.—The Southwest Topeka Bypass was about to be completed at the close of the year. This 6.7-mile freeway, costing $6.8 million, and a 4.3-mile portion of the Kansas Turnpike form I–470 circumscribing Topeka on the south. Travelers using the Southwest Bypass averaged 60 miles per hour and saved 16 minutes in time and 4.2 miles in distance as compared with the former route on city streets. The Bypass had become an important local traffic distributor and had generated residential development along its course. I–70, passing through Topeka to complete the city circumferential, was completed to Interstate standards for 159 miles westward from Kansas City to near Abilene except for a 38-mile section which has controlled access but only 2 lanes.

Kentucky.—A 4.3-mile section of I–65 in Louisville was opened to traffic during the year. The 4- and 6-lane freeway carries traffic at 50 miles an hour through a congested area to the edge of the central business district. I–65,

which includes the Kentucky Turnpike, is now completed southward for 57 miles. A 1.4-mile section north to the Indiana State line was under construction. The 4.3-mile section just completed cost $22.6 million and included several large bridges. Travel time for residents within a large radius has been reduced as much as 50 percent in peak hours.

Louisiana.—A 5.4-mile crossing over an arm of Lake Ponchartrain was being built as a part of I–10 at a cost of $15.6 million. The twin 3-lane bridges will greatly reduce traffic congestion in and out of New Orleans, 20 miles to the southwest. Except for the main channel spans, all bridge components were being precast at the contractor's plant and barged 24 miles to the site. These included pretensioned 54-inch diameter piles 82 to 142 feet long, pile caps, and prestressed deck girder spans cast as complete units. The steel spans over the channel will provide 150-foot horizontal and 65-foot vertical clearance for shipping.

Maine.—The 6-lane Tukeys Bridge over Back Cove in Portland was completed as part of I–295 during the year. The 4-span continuous deck girder bridge, 500 feet long, replaced an obsolete swing span bridge that was totally inadequate for current traffic of 33,000 vehicles per day. Included in the $3.0-million project were traffic interchanges at both ends of the bridge approaches. An 8-mile section of Interstate 295 from the bridge to I–95 in Falmouth was under construction.

Michigan.—A 25-mile section of I–94 from Ann Arbor to Jackson, opened to traffic during the year, completed the cross-State freeway extending 203 miles west from downtown Detroit to Lake Michigan. Some 150 miles were built under the Interstate program since 1956. It is estimated that 20 lives will be saved annually by this route, on which traffic was already 37 percent greater than on the obsolete, winding 2-lane route which it replaces.

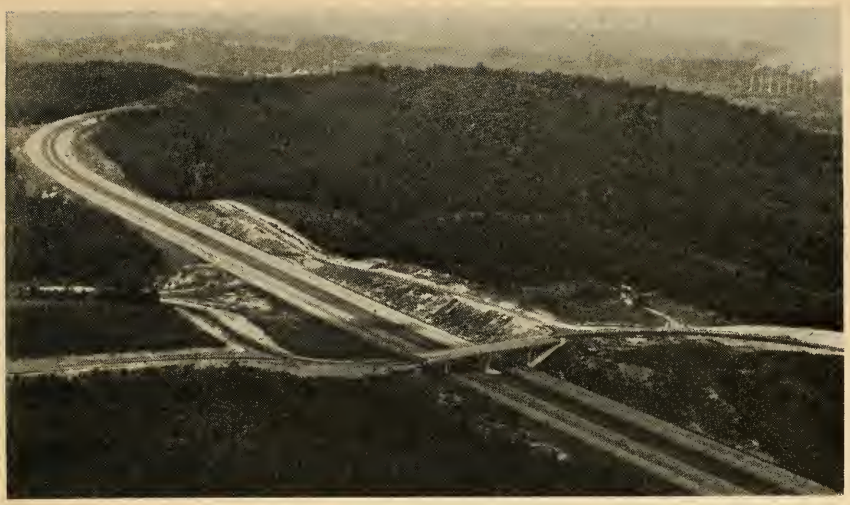
Minnesota.—A 5.3-mile section of I–35 from the suburbs north of St. Paul to the edge of the downtown area was scheduled for completion in the fall of 1961. The 4-lane depressed freeway, tapping the "bedroom suburbs" and providing easy access for shopping and commuting to downtown St. Paul, is expected to carry 70,000 vehicles per day by 1975, relieving congestion on local streets.

Mississippi.—A complex interchange on I–55 was under construction in Jackson. This 4-lane, divided highway, built prior to the Interstate program, has since been converted to full control of access with Interstate Federal aid.

Missouri.—A 21-mile section of 4-lane freeway including a new bridge over the Missouri River was completed during the year on I–70, from near Columbia to west of Booneville, making a continuous stretch of 35 miles open to traffic. The $18-million project included 8 interchanges, 11 highway and 2 railroad grade separations, and frontage roads where needed for local traffic movement. The contractor's men put in 1.1 million man-hours of work on the project. In addition to relieving congestion on the main business street in Booneville and across the old narrow Missouri River bridge, the new route is 1½ miles shorter than the old one. During a 3-month period there were 9 accidents involving 9 injuries on the new route, as compared with the old route's record of 40 accidents involving 33 injuries and 1 fatality during a like period in the previous year.

Nevada.—A 9.8-mile section of I–15 was completed south of Las Vegas at a cost of $2.1 million. This, together with construction underway on an adjacent project and previously built sections, will provide a 4-lane freeway from the California State line to McCarran Air Field near the south city limits of Las Vegas.

New Hampshire.—A 13.7-mile portion of I–89 running northwest from Concord was completed during the year. The $7.1-million freeway was designed as



Interstate Route 40 near Kingston, Tenn. Nearby is the TVA Kingston steam plant, largest in the world.

two independent roadways, with natural forest growth left undisturbed in-between. The route, which eventually will cross Vermont and connect with a road to Montreal, serves the summer and winter recreation area at Lake Sunapee near Concord.

New Jersey.—A 3.7-mile section was completed at a cost of $7.0 million on I–80 near Dover. In this short stretch of 6-lane freeway, structures were required at 5 crossroads, 2 railroads, and a river.

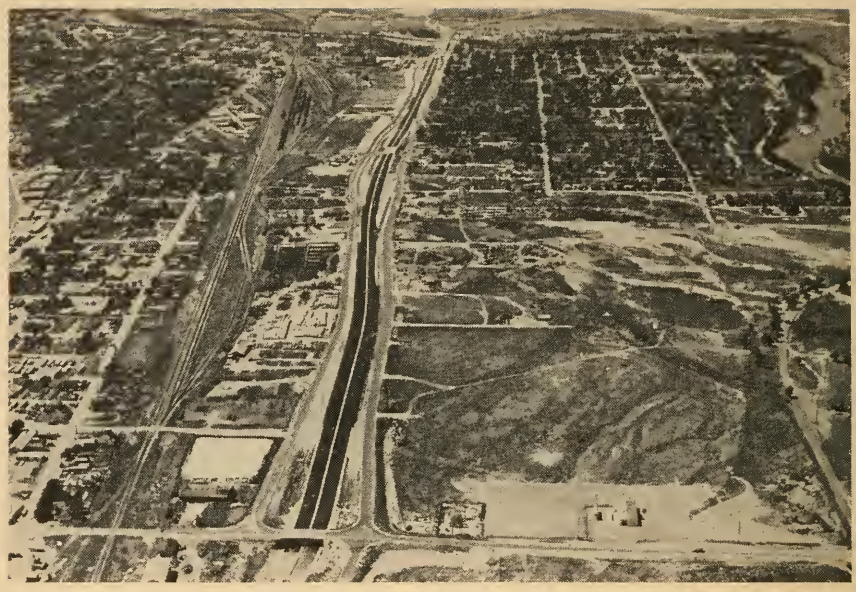
New Mexico.—Work was completed on a 3.9-mile section of I–40 running west from the east urban limits of Albuquerque. Opening of this 4-lane freeway will greatly relieve the traffic congestion on U.S. 66, which runs through the downtown business section.

New York.—Ten miles of I–87 near Glens Falls were opened to traffic during the year. The 4-lane freeway has a 60-foot minimum width median to allow for additional lanes when increased traffic requires them. The $9.5-million project included twin 3-lane bridges 734 feet long across the Hudson River. The new section, bypassing Glens Falls, has greatly relieved congestion on U.S. 9, the city's main street. Portions of I–87 previously completed include a 9-mile bypass of Plattsburgh and a 15-mile bypass of Albany.

North Carolina.—A 34-mile section of I–40 between Hildebran and Marion was completed during the year at a cost of $15.5 million. Secretary of Commerce Luther H. Hodges, former Governor of the State, formally opened the 4-lane divided freeway during National Highway Week.

North Dakota.—A portion of I–94 was opened to traffic from Casselton to the Red River bridge at the Minnesota State line. The 19-mile project is adjoined to the west by 36 miles of work under construction. When completed next year this will provide a 143-mile stretch of freeway west from the Minnesota border. The project completed during the year bypasses Fargo and will greatly improve driving conditions in this area.

Ohio.—Construction underway during the year will, when completed, provide 85 miles of continuous freeway on I–75 between Dayton and Lima. Some 68 miles of this distance were completed generally to full Interstate standards with



This completed section of Interstate Route 25 through Casper, Wyo., parallels the railroad, leaving room for industrial development between.

Interstate Federal aid at a cost of $60 million. Considerable relief has been afforded to U.S. 25, formerly the main route between Cincinnati and Toledo.

Oklahoma.—A 45-mile section of I–35 was completed, beginning 15 miles north of Oklahoma City and extending north to Perry. Twin bridges included in the construction span the Cimmaron River.

Oregon.—Another section of I–5 was opened to traffic near the end of the year, substantially completing the 109 miles of 4-lane highway from the Portland city limits to Eugene. Driving time over this distance was reduced to 1 hour and 40 minutes, 42 percent less than on the old route. The 42-mile Albany-Eugene section cost $23.9 million, including a $2 million bridge over the Willamette River. Completion of the structure will permit through traffic to bypass Eugene and save even more travel time.

Pennsylvania.—A 7.2-mile section on I–70 south of the Breezewood interchange of the Pennsylvania Turnpike was completed during the year. The existing 2-lane highway, constructed less than 10 years earlier, was used as one roadway of the new divided freeway. The two roadways were independently located and were notched into the steep hillsides.

South Carolina.—The 98 miles of I–26 between Clinton and Orangeburg were opened to traffic during the year. Coupled with new Federal-aid improvements on U.S. 276, travelers between Columbia and Greenville can ride on 101 miles of freeway, saving 5 miles in distance and 30 minutes in time.

South Dakota.—A 19.6-mile section of I–29 lying between Sioux Falls and Sioux City, Iowa, was completed during the year at a cost of $9.3 million. The 4-lane freeway replaces an old road with narrow pavement and right-of-way widths.

Tennessee.—Work was nearing completion on a 35-mile section of I–40 from Knoxville to the Clinch River, including a long bridge there. The new route is 4 miles shorter than the old one.

Texas.—A 4.1-mile section of I–35 costing $3.2 million was completed north of Austin. The new freeway skirts Round Rock, taking through traffic off the main street.

Utah.—In the southwest corner of the State, 5.4 miles of freeway were being constructed adjacent to previously built sections of I–15. Completion of the project in the fall of 1961 will open a 22-mile stretch of I–15 to traffic in Washington County.

Vermont.—Construction was nearing completion on 7.4 miles of I–89 in the Winooski River valley between Waterbury and Bolton. The $8.7-million freeway project involved construction of 10 bridges and heavy excavation through ledge rock.

Virginia.—A 7.4-mile section of I–81 was opened to traffic during the year in the southwestern part of the State, bypassing Pulaski. Further construction was underway at both ends of the completed section.

Washington.—A 5.2-mile portion of I–4 in Bellingham was opened to traffic during the year. The $5.2 million freeway removes through traffic from the city's streets, yet provides excellent access to the city.

West Virginia.—Construction on 18 miles of I–77 was nearing completion north of Charleston. Design was underway for an adjacent 14-mile section, and 11 miles of the route were under construction further north. The old, winding 18-foot wide route carried up to 4,200 vehicles daily, often at speeds of only 25 miles per hour. Travel on the new route will be twice as fast and the accident rate will be cut in half.

Wisconsin.—A 55-mile section of I–90 between Madison and the Wisconsin Dells resort area was almost ready for traffic use at the close of the year. The $34 million project included twin bridges across the Wisconsin River costing $2 million. In addition to serving an agricultural area and a large volume of tourist traffic, the freeway provides a much better and shorter truck route between Chicago and Minneapolis-St. Paul.

Wyoming.—A 1.3-mile section of I–25 through Casper was completed during the year at a cost of $959,000. Service roads were provided on both sides of the 4-lane freeway for local traffic and two interchanges provide access to the city.

Federal-Aid Improvement of Primary Highways

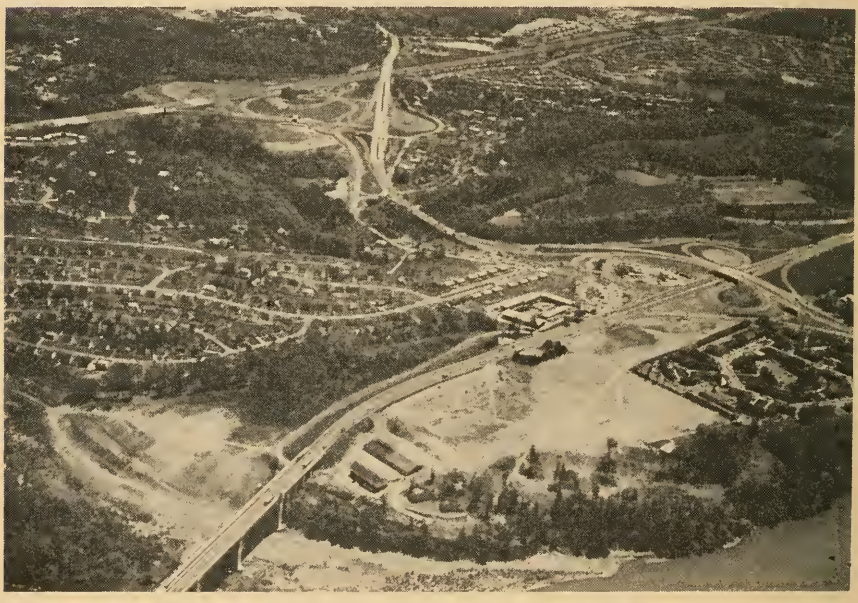
The Federal-aid primary highway system, as of December 31, 1960, covered 265,477 miles of the principal highways of the Nation and included 240,875 miles of main rural roads and 24,602 miles in urban areas. These mileages include the Interstate System which by law is a part of the primary system.

Federal-aid primary fund authorizations, which may be used for either rural or urban portions of the primary system, have ranged upward in recent years from $247.5 million for fiscal year 1954 to $416.25 million for fiscal year 1962 of which $312,187,500 was apportioned on July 22, 1960, and the remainder on December 30, 1961.

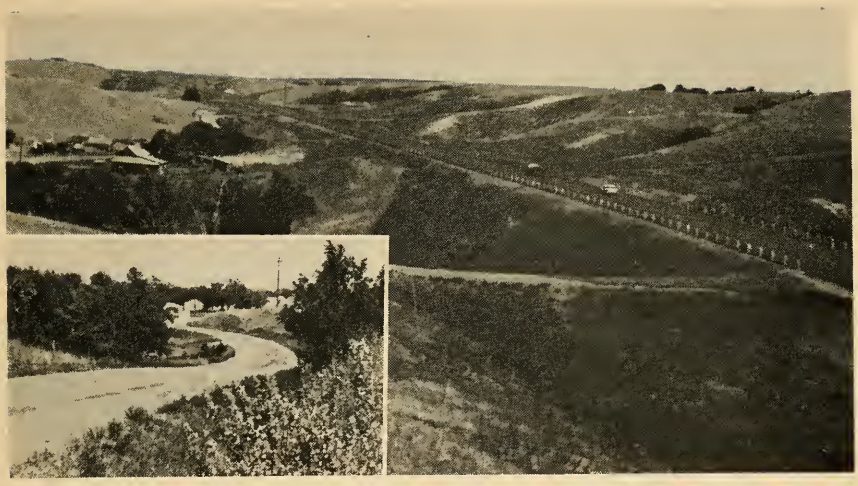
During the fiscal year, 6,115 miles of improvements, estimated to cost over $869 million and involving $463 million of Federal-aid primary funds, were programed.

Improvements involving Federal-aid primary funds were completed during the year on 5,061 miles of the Federal-aid primary system at a total cost of $675 million of which $351 million was Federal aid. The projects completed included 4,311 miles of bituminous and portland cement concrete surfacing, 864 bridges over streams, and 168 bridges over highways to provide traffic grade separations. In addition, railway-highway crossings were eliminated by construction of 77 grade-separation structures and 8 existing structures were

This Federal-aid project on U.S. 95 along the Salmon River near Freedom, Idaho, required a 1,500-foot relocation of the river channel and a rock cut 400 feet deep.



New Jersey has eliminated a serious bottleneck by construction with Federal aid of this interchange in New Brunswick. One of the State's first traffic circles was built here in 1932. The new interchange carries 4-lane N.J. 18 over 6-lane U.S. 1, and handles over 70,000 vehicles per day. The New Jersey Turnpike crosses the top of the picture.



An 11-mile section of U.S. 52 near Minot, N. Dak., has been relocated with Federal aid. The new route, with better width and alinement, will greatly increase safety and reduced travel time. These pictures show typical scenes on the old and new roads.

reconstructed; 108 grade crossings were protected by installation of signal devices.

An increasing proportion of the Federal-aid primary system was being built as multilane, divided highways, some with partial or full control of access. An example is State Route 17 in New York between Harriman and Parksville, which has cut driving time on this important 58-mile dairy supply and recreation route out of New York City to less than half and relieved congestion in the towns along it.

Federal-Aid Improvement of Urban Highways

Highways in urban areas eligible for improvement with Federal aid as of December 31, 1960, totaled 38,307 miles of which 24,602 were on the Federal-aid primary system (including the Interstate System) and 13,705 on the Federal-aid secondary highway system.

During the fiscal year almost 50 percent of all work programed on the Interstate System was for improvement in urban areas. This is commensurate with both the estimated cost of improving the Interstate System and of travel in the United States; in both cases the urban proportion being nearly half.

Federal-aid urban fund authorizations have increased in recent years from $137.5 million for fiscal year 1954 to $231.25 million for fiscal year 1962 of which $173,437,500 was apportioned on July 22, 1960, and the remainder on December 30, 1960. During the year, in addition to the funds approved for projects from the Federal-aid urban authorizations, 8 percent of all primary Federal-aid highway funds were approved for urban highway work.

Plans approved for Federal-aid construction projects in urban areas during the past fiscal year totaled $1,843,120,661 and covered 1,011 miles of highway improvement. Of this total, $1,318,055,112 was Federal aid, comprised of $244,870,486 from the urban authorizations, $33,244,088 from the primary fund authorizations, and $1,031,566,229 from Interstate funds.

Federal-aid construction work in urban areas completed during the fiscal year consisted of 1,047 miles of highway improvements costing $1,193.2 million of

The Roosevelt Expressway in Philadelphia, Pa., was completed with Federal aid during the year. This controlled-access route will relieve overcrowded U.S. 1 and cut travel time in the area it serves. In the background are twin 2,000-foot-long high-level bridges over the Schuylkill River.

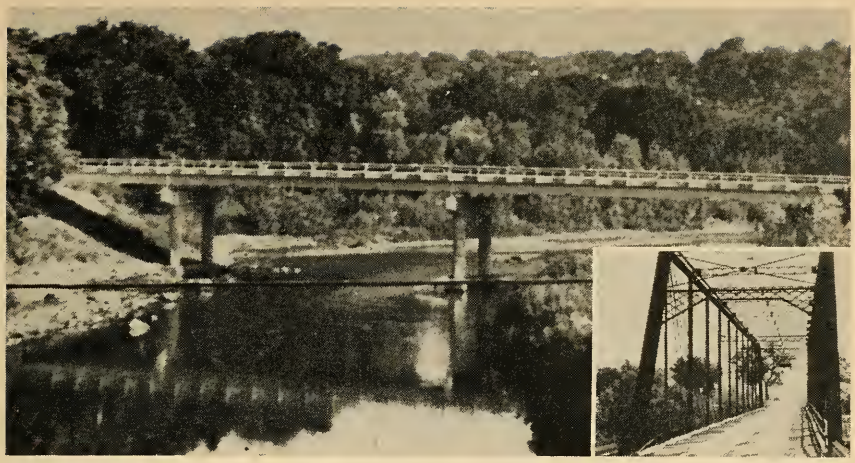
which $817.6 million was Federal aid. The completed work included 859 miles of bituminous and portland cement concrete surfacing, 307 bridges over streams and rivers, and 737 bridges to provide traffic grade separations between crossing highways. In addition, 147 railway-highway separation structures were completed and 7 existing ones were reconstructed, and 58 railroad grade crossings were protected by installation of signal devices.

Secondary or Farm-to-Market Roads

The Federal-aid secondary network of farm-to-market, feeder, schoolbus, and mail-route roads is the largest of the Federal-aid highway systems. Its length as of December 31, 1960, was 601,364 miles, including 13,705 miles of extensions into or through urban areas. The Federal-aid authorizations for this system have increased from $165 million for fiscal year 1954 to $277.5 million for fiscal year 1962 of which $208,125,000 was apportioned on July 22, 1960, and the remainder on December 30, 1960.

During the fiscal year, a total of 13,793 miles of improvements, estimated to cost over $582 million and involving $308 million of Federal-aid secondary funds, were approved on the secondary system. Improvements were completed during the year on 13,578 miles of the secondary system at a total cost of $484.2 million, involving $252.1 million of Federal-aid secondary funds. Of the improvements completed, 9,119 miles involved bituminous or portland cement surfacing, 3,400 miles were gravel or stone surfaced, and 1,006 miles were graded and drained preparatory to receiving surfacing. Also completed were 1,753 bridges over streams and 24 bridges over highways; 40 new railway-highway grade separation structures and reconstruction of 4 others; and protection of 246 other railway-highway crossings by signal devices.

For the 16 years that Federal funds for the secondary program have been apportioned to the States, a total of 51,116 projects involving 198,821 miles of improvements have been completed. The projects have been widely distributed each year through an average of 2,000 counties, with an average of about 3,200 projects being completed each year.



Federal-aid secondary funds built this continuous beam span over the Blue Earth River near Mankato, Minn., replacing the 80-year-old truss with its narrow plank roadway.

The Federal-aid secondary program differs considerably from the other Federal-aid highway programs. The system is not limited in length by Federal legislation, the only limitations being that mileage which can be properly improved and maintained. The routes of the system and the projects to be constructed are selected cooperatively by the State highway departments and local highway officials. Another difference is that under the 1954 Act the administrative procedure between Public Roads and the States in carrying on the secondary program has been simplified, with the States assuming greater responsibility. The procedure is a voluntary one, and at the end of the fiscal year all States except Alaska, Hawaii, Indiana, and the District of Columbia had adopted it.

The Board of County Consultants met with Public Roads officials in Atlanta, Ga., in September 1960. The nine-member Board, formed to promote better mutual understanding on the Federal-aid secondary program among county engineers, the State highway departments, and the Bureau of Public Roads, has given effective counsel and advice in administrative problems that affect the counties, and has helped to disseminate information on the secondary program to local road officials.

Special Federal-Aid Authorization

The Federal-Aid Highway Act of 1958 provided $400 million (the so-called D funds) in addition to regular ABC fund authorizations, to accelerate the highway program and stimulate the economy. The act provided that the D funds should be matched on a two-thirds Federal, one-third State basis. To aid the States in meeting up to two-thirds of their matching share, $115 million (so-called L funds) were also authorized as an advance. Under the legislation, such advances requested by the States were deducted in equal installments from their individual ABC apportionments for the fiscal years 1961 and 1962.

The 1958 act required that the D funds be placed under contract by December 1, 1958, with construction scheduled for completion by December 1, 1959. In general, that objective was met, although some projects were not completed on schedule because of delays resulting from bad weather and other unforeseen

This 8½-mile Federal-aid secondary project north of Gran Quivera, N. Mex., replaced a narrow, crooked dirt road which was often made impassable by rain or snow.

circumstances. At the end of the fiscal year a very small amount of construction under this program was still underway.

Several of the appendix tables in this report specifically cover the D fund program. Statistics cited in the sections of the report dealing with Federal-aid improvements of primary, secondary, and urban highways include work done under the D fund program.

Repair of Roads Damaged by Natural Disasters

The Federal Government for many years has furnished financial aid to the States in the repair and reconstruction of highways and bridges on the Federal-aid systems damaged or destroyed by floods, earthquakes, and other catastrophes over a wide area. The Federal-Aid Highway Act of 1956 provided a maximum of $30 million annually for these purposes. The Federal-Aid Highway Act of 1959 amended the legislation to permit the use of these funds for the repair and reconstruction of Federal domain roads, such as those in National forests and parks, damaged as a result of a catastrophe, without the necessity for a declaration of an emergency by the Governor of the State concerned and regardless of whether the road involved was on one of the Federal-aid systems. The availability of these emergency funds makes prompt assistance possible without the need for special legislative action following each catastrophe.

During the fiscal year 10 States received contributions in aid from Federal emergency funds to assist in financing the costs of repair and reconstruction of roads and bridges on the Federal-aid systems seriously damaged by natural catastrophes. Five States received assistance for damages from recent hurricanes and floods and five States were aided in completing work caused by prior catastrophes ranging from earthquakes, floods, and seismic wave damage to volcanic eruptions. Allocations of emergency funds totalling $2,402,486 were made during the fiscal year to these 10 States for rehabilitation work estimated to cost a total of $4.25 million. Amounts allocated were: Florida, $241,250; Georgia, $20,500; Hawaii, $776,257; Iowa, $146,900; Mississippi, $47,345; Montana, $455,080; Nebraska, $357,600; New Hampshire, $95,500; North Carolina, $163,750; and Washington, $98,304.

During the year Public Roads was called upon by the Office of Civil and Defense Mobilization to render assistance, as authorized and required by law (P.L. 875), in connection with natural disasters such as floods. Such disasters occurred in Alabama, Arkansas, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Mississippi, Missouri, Montana, Oklahoma, South Dakota, and Texas. Total damage to non-Federal-aid roads (eligible for assistance under the cited statute) was estimated at $6,150,000. Funds for the repair of such damage are made available to the States by the Office of Civil and Defense Mobilization.

The Highway Trust Fund and Reimbursement Planning

Federal legislation requires that the Federal-aid highway program be financed from the Highway Trust Fund, established by the Highway Revenue Act of 1956. Repayable advances from the General Fund of the Treasury are authorized as a temporary expedient, but such advances are repaid from revenues available in the trust fund before the close of the same fiscal year.

Federal motor-fuel taxes have provided four-fifths of the revenues accruing to the Highway Trust Fund, with the tax on tires ranking second as a revenue source. Net receipts during the 5 fiscal years 1957–61 and the tax rates in existence during that period were as follows:

	Receipts (millions)	*Percent of total*
Motor fuel: 3 cents per gallon through Sept. 30, 1959; 4 cents per gallon thereafter:		
Gasoline	$8,697	79.4
Diesel fuel	299	2.7
Total, motor fuel	8,996	82.1
Trucks, buses, and trailers: half of the 10-percent tax on manufacturer's price	509	4.7
Tires: 8 cents per pound for highway tires and 5 cents per pound for other tires	1,100	10.1
Inner tubes: 9 cents per pound	66	.6
Tread rubber: 3 cents per pound	67	.6
Heavy vehicle use: $1.50 per 1,000 pounds annually on vehicles over 26,000 pounds gross weight	178	1.6
Interest earnings less interest payments	32	.3
Total	10,948	100.0

Trust fund receipts totaled $10.948 billion during the 5 fiscal years 1957–61, and expenditures totaled $10.650 billion. The trust fund balance on June 30, 1961, was $298 million. Revenues, expenditures, and year-end balances for the 5 fiscal years are shown in the table on this page.

Highway Trust Fund revenues, expenditures, and balances, fiscal years 1957–61

Fiscal year	Revenues	Expenditures	Balance
	Millions	*Millions*	*Millions*
1957	$1,482	$966	$516
1958	2,044	1,511	1,049
1959	2,088	2,613	524
1960	2,535	2,940	119
1961	2,799	2,620	298
Total	10,948	10,650	298

It was necessary to obtain a repayable advance of $60 million from the General Fund in October 1960 in order to assure prompt payments to the States. This advance was repaid to the General Fund, with interest, during January 1961. It is expected that the carryover balance at the beginning of fiscal year 1962 will make a repayable advance unnecessary during the year, although the balance will be almost entirely utilized by the end of December 1961.

Future program

As described earlier in this report, the Federal-Aid Highway Act of 1961 provided additional Interstate authorizations in the amount of $11.56 billion, for a total Interstate program of $37 billion in Federal funds, and increased some of the Federal excise taxes to provide the necessary revenue. The ABC program authorizations are traditionally made on a biennial basis, but the Congress has expressed its intent to increase the annual ABC authorizations by $25 million every 2 years, beginning with fiscal year 1964, until a $1 billion annual level is reached in fiscal year 1968.

Revenues that will accrue to the Highway Trust Fund under the provisions of the 1961 Act are estimated to total $41.479 billion for the period July 1, 1961, through September 30, 1972, and $52.485 billion for the entire trust fund period July 1, 1956, through September 30, 1972. These amounts, reflecting a net increase of $9.682 billion, are expected to be adequate to finance the authorized Interstate program and the continuing ABC program.

Reimbursement planning

Reimbursement planning, involving quarterly reimbursable obligation ceilings (sometimes referred to as contract control), has been in effect since October 1959 as a means of regulating new obligations on Federal-aid highway projects so that the Federal funds required to reimburse the States for work done would not exceed revenues available in the Highway Trust Fund. Institution of this procedure was necessary because of financing difficulties prior to passage of the 1961 legislation, as described in last year's annual report. The unliquidated obligations together with unobligated balances of both prior and new apportionments could generate cash requirements exceeding revenues available in the Highway Trust Fund if the rate of obligation were not firmly controlled.

Federal funds are obligated when the States are authorized to proceed with preliminary engineering work, acquisition of right-of-way, and advertising for bids on construction projects. As of June 30, 1961, the Interstate and ABC funds obligated for future payment from the Highway Trust Fund (unliquidated obligations) totaled $5.0 billion. The unobligated balances of apportioned Interstate and ABC funds amounted to an additional $2.8 billion, and the apportionment of funds authorized for the fiscal year 1963 will make available for future obligation an additional $3.3 billion of Federal funds.

The reimbursable obligation schedule for fiscal year 1961 was announced on June 10, 1960, in the amount of $2,873,613,000, as compared with $2.7 billion for the previous year. Authority was given the States to obligate the first and second quarterly allotments of $718 million each during the first 3 months of the fiscal year. The 1961 schedule was based on $2.0 billion for Interstate highways and the remainder for the ABC program. However, the States could obligate available balances of either Interstate or ABC funds as desired.

The third and fourth quarter allotments of $718 million each were made available several months in advance of the respective quarters.

Recognizing that some States might wish to obligate available balances of apportioned Federal-aid funds at a faster rate than provided for by the reimbursable obligation schedule, the States were authorized to proceed with

projects in excess of reimbursable obligation ceilings; but with the understanding that when the State desires reimbursement for such projects, the Federal fund amounts are to be charged to the reimbursable obligation schedule and reimbursement is to be claimed over a 3-year period. Ten States had advanced projects on this basis, involving $218 million in Federal fund obligations.

The first quarter reimbursable obligation schedule for fiscal year 1962 was released on May 17, 1961, in the amount of $818 million.

Reports to Congress

Interstate System cost estimate

Section 104(b)5, Title 23, United States Code, requires that the Bureau of Public Roads, in cooperation with the State highway departments, make periodic detailed estimates of the cost of completing the Interstate System. Such estimates, when approved by the Congress, are used in apportioning Federal-aid funds for the Interstate System among the States, each State receiving a share of the total annual apportionment equivalent to its proportion of the total cost estimate.

The first of these estimates was reported to the Congress in January 1958 and was used as a basis for apportioning the Interstate funds authorized for the fiscal years 1960–62. The second estimate, reported to the Congress on January 11, 1961, was published as *The 1961 Interstate System Cost Estimate*, House Document 49, 87th Congress, 1st Session. The 1961 estimate was approved by the Congress as the basis for apportionment factors for fiscal years 1963–66.

The preparation of the estimate was a tremendous task, requiring close to 2 million man-hours of work on the part of the State highway departments and Public Roads, at an estimated cost of $7.5 million. Uniformity in the preparation of the estimate was achieved by close adherence to guides contained in an instruction manual prepared by Public Roads and by close cooperation among engineers and other officials of the State highway departments and Public Roads.

Covered by the 1961 cost estimate, in addition to the 38,522 miles of the system represented in the 1958 estimate, were 1,902 miles designated in October 1957 and 48 miles in Hawaii designated in August 1960, making a total of 40,472 miles. Approximately 220 miles of designated routes for which detailed locations had not been determined were omitted from the estimate, as well as 308 miles within the 41,000-mile statutory limit that were reserved for adjustments in final measurement.

The 1961 estimate showed that the cost of work remaining to be authorized as of January 1, 1960, was $32.9 billion, including $0.2 billion for construction underway or completed by five States under Federal legislation provisions by which the costs will ultimately be reimbursed in part with Federal-aid funds. At the time the report was made, in January 1961, there were available unobligated balances of Federal-aid Interstate funds which, with State matching funds, amounted to $6.0 billion; and work financed from other sources amounting to $1.4 billion was anticipated. Thus, the estimated cost of work remaining to be financed was $25.5 billion, of which $23.4 billion would be Federal funds and $2.1 billion State matching funds.

The 1961 total estimate of cost was the same amount as furnished to the House Ways and Means Committee at hearings in July 1959, based on the 1958 estimate plus other supplemental costs. However, there were included in the 1961 estimate the related Interstate program costs for State highway planning and research and for Bureau of Public Roads administration and research, in order that the Federal funds required for these items would be accounted for in estimates of total future financing requirements. Inclusion of these costs did

not exceed the $41 billion total amount based on the 1958 estimate. This was possible because of a reduction of about $1 billion in the indicated cost of constructing the Interstate System as reported in the 1961 estimate, as compared to the estimate submitted in January 1958.

Of the total 40,424 miles of continental routes studied (exclusive of the 48 miles in Hawaii), 35,326 miles were in rural areas and 5,098 miles or 13 percent were in urban areas. Some 2,267 miles or 6 percent of the total were toll roads, bridges, and tunnels.

About 80 percent of the system will be built on new location, providing savings to the traveling public by more direct routing and effecting economy in construction costs by avoiding the need for moving or destroying developments along existing highways.

The bulk of the Interstate System mileage, 33,923 miles or 84 percent, will be 4-lane divided highways, while 3,208 miles will be 6-lane and 1,068 miles will be 8 lanes or more. Only 2,225 miles or about 6 percent will be 2-lane. The 40,424 miles of routes will add up to 168,071 lane miles of highway. In addition, 5,770 miles of the system will have frontage roads on one side and 3,607 miles will have them on both sides, adding 9,377 miles of construction to the total of the main routes.

On the 40,424 miles of Interstate System routes studied there were planned 12,099 interchanges, accounting for 18,622 individual structures. There were also 18,100 highway grade separations, 3,842 railroad grade separations, and 12,959 stream and other bridges and tunnels, making a total of 53,523 individual structures. In the rural areas, interchanges averaged about 4½ miles apart; other highway grade separations averaged about 3½ miles apart; bridges for other purposes, 4 miles apart.

The cost of remaining work to complete the Interstate System in the continental United States (excluding the $0.2 billion commitment for work underway or completed, mentioned above) was estimated at $18.0 billion in rural areas and $14.5 billion in urban areas; about 55 percent rural and 45 percent urban. The total $32.5 billion included $0.7 billion for preliminary engineering, $4.6 billion for right-of-way, and $27.2 billion for construction, construction engineering, and contingencies. Of the $27.2 billion representing actual construction costs, $6.0 billion was for clearing, grading, and drainage work, $5.9 billion for base, pavement surface, and shoulders, $10.8 billion for major structures, and $4.5 billion for miscellaneous items. The structures costs comprised $4.3 billion for interchanges, $2.4 billion for highway and railroad grade separations, and $4.1 billion for stream bridges and tunnels.

The average costs per mile for the Interstate System, developed from the 1961 estimate and the costs of work authorized between July 1956 and January 1960, amount to $639,000 per mile in rural areas and $3,658,000 per mile in urban areas, with an overall average of $1,006,000. The averages developed from the 1958 estimate were $681,000 per mile in rural areas, $3,951,000 in urban areas, and an overall average of $1,042,000. The lower average figures from the 1961 cost estimate reflect the reduction in construction cost estimates noted earlier.

Major structures are, of course, an expensive element in highway construction. The average interchange cost to complete was $455,000. Direct-connection type interchanges between high traffic-volume routes usually require several structures per interchange, and the average cost of an interchange structure was $310,000. The cost to complete the average highway grade separation was $158,000 while the cost to complete the average railroad grade separation and combination highway-railroad grade separation was $342,000. The cost to complete other bridges, mostly stream crossings, was $339,000 per crossing.

In rugged mountainous terrain, in the downtown centers of large cities, and for crossing busy harbors, tunnels become the only feasible or economical design solution to the location problem, although expensive. The cost to complete 43 tunnels on the Interstate System totaling 30.3 miles in length was $667 million.

Estimates of Interstate System traffic indicated a probable rise from 101 billion vehicle-miles on the traveled way in 1958 to 282 billion vehicle-miles in 1975, almost a threefold increase.

Highway cost allocation study

The final report of the highway cost allocation study, which was required under Section 210 of the Highway Revenue Act of 1956, was submitted to the Congress in January 1961. The report was published in two volumes as House Documents 54 and 72, 87th Congress, 1st Session, the former containing parts I–V and the latter part VI of the report. These parts were titled as follows:

Part I.—Introduction and summary of findings.
Part II.—General discussion of the study.
Part III.—Allocation of highway costs between private and commercial users and other classes and interests.
Part IV.—The allocation of tax support of the Federal-aid systems among vehicles of different dimensions, weights, and other specifications.
Part V.—Competition of highways with other modes of transportation.
Part VI.—Studies of the economic and social effects of highway improvement.

The objectives of and the work undertaken for the highway cost allocation study have been described in some detail in previous Public Roads annual reports and in a series of progress reports to Congress. Briefly, the objective of the study was to provide the Congress with information on the basis of which it might make a more equitable allocation of Federal taxes for the support of the Federal-aid highway program. The results of this study, reflected in the final report, were utilized in preparing material for the President's proposals to the Congress during the fiscal year regarding the financing of the Federal-aid program, in preparing additional statements in further support of the President's proposals, and in responding to Congressional requests for information before and during the several hearings which led to passage of the Federal-Aid Highway Act of 1961.

A supplementary report presenting the results of a preliminary cost allocation by the incremental method, based on preliminary data from the AASHO Road Test (described elsewhere in this report), was also submitted to the Congress but was not published as a Congressional document. It was, however, included in *Federal-Aid Highway Financing*, hearings before the Committee on Ways and Means, House of Representatives, 87th Congress, 1st Session, on the President's proposal for financing the Federal-aid highway program, March 1961 (pp. 114–130). The inability to include an analysis by the incremental method in the final report of the highway cost allocation study as published, and the submittal of a preliminary analysis to the House Ways and Means Committee, were occasioned by the fact that the traffic operations on the AASHO Road Test did not come to an end until November 30, 1960, whereas the due date for the final report of the highway cost allocation study was January 3, 1961. It was impossible for the Road Test staff to produce final equations giving, for both rigid and flexible pavements, the relations between thickness of pavement base and subbase, and the numbers of application of axle loads of different magnitudes, until several months after completion of the test.

A supplement to the final report of the highway cost allocation study, which will contain an allocation of cost responsibility among motor vehicles of different dimensions and weights by the incremental method, was in course of preparation at the end of the fiscal year. This analysis will be based, in part, upon the final equations derived from the results of the AASHO Road Test.

Maximum desirable vehicle sizes and weights

The Federal-Aid Highway Act of 1956, in section 108(k) as amended, directed the Secretary of Commerce to make recommendations to the Congress with respect to maximum desirable dimensions and weights for vehicles operated on the Federal-aid highway systems. The legislation recognized the necessity of employing, in the development of such recommendations, the final results of the AASHO Road Test (described elsewhere in this report). Notwithstanding the efforts made to expedite the Road Test, final results were not available at the required time to meet the Department's needs in preparing its recommendations. However, an interim report, *Maximum Desirable Dimensions and Weights of Vehicles Operated on the Federal-Aid Systems*, was transmitted to the Congress by the Secretary of Commerce on January 3, 1961. (This interim report was not published.)

It is planned to complete and transmit to the Congress a report embodying the final recommendations on vehicle sizes and weights, during fiscal year 1962. The recommendations will be supported by the results of extensive surveys conducted by Public Roads with the assistance of the State highway departments, and by the pertinent final results of the AASHO Road Test, made available to Public Roads in May 1961 for this purpose.

The development of recommendations of the Department of Commerce to Congress was being coordinated with the work of the American Association of State Highway Officials, which was actively engaged, during the fiscal year, in a thoroughgoing review of its 1946 *Policy Concerning Maximum Dimensions, Weights and Speeds of Motor Vehicles to be Operated over the Highways of the United States*. Appropriate consideration was being given to both road costs and vehicle costs, in the interest of overall economy of highway transportation, a subject of intensive study by the Highway Research Board committee on economics of motor vehicle size and weight. Meanwhile, the States were appraising the capabilities of their present highway systems in light of the results of the AASHO Road Test.

In the Federal-State joint surveys, the AASHO Road Test, and the economic studies under the auspices of the Highway Research Board, the Federal Government, the States, and industry were working in close harmony to develop those facts of common interest and to reach supportable conclusions with respect to reasonable limitations of motor-vehicle dimensions and weights, important to the economy of the Nation.

Highway Improvements Under Direct Supervision of Public Roads

The Bureau of Public Roads, under existing legislation, receives and administers directly annual appropriations for major highways through national forests, and performs highway engineering and construction services for other Federal agencies as required by law and as may be requested for specific projects. The principal agencies receiving direct appropriations for the construction and maintenance of roads and requesting assistance from Public Roads include the Departments of Agriculture, Defense, and Interior. During the past year, Public Roads also continued to supervise directly considerable Federal-aid highway construction in Alaska in accordance with a contract with the State.

Public Roads in this general program for highway and bridge construction makes surveys, prepares plans and specifications, advertises for bids, and supervises the construction of the projects.

During the past year, improvements under the direct supervision of Public Roads were completed on 148 projects involving 749 miles and Federal funds totaling $58.6 million. At the close of the year, Public Roads was actively engaged in providing engineering and construction services for other projects under its direct supervision estimated to cost $155 million. The following tabulation provides a breakdown of this work by type of program (the figures represent the estimated cost of work in the program, plans approved, advertised, and/or construction stage):

Forest highways [1]	$71, 339, 752
Parkways	35, 648, 210
Park roads	18, 135, 665
Bureau of Land Management roads	11, 154, 580
Department of Defense, access roads [2]	5, 368, 435
Alaska Federal-aid projects [3]	3, 054, 959
National Science Foundation, Kitt Peak observatory road	2, 823, 295
Federal lands highways	2, 441, 000
Forest development roads	2, 399, 327
Woodrow Wilson Memorial Bridge [4]	1, 549, 845
Emergency relief, Yellowstone National Park earthquake area	420, 000
Bureau of Indian Affairs, Indian reservation roads	328, 301
Miscellaneous reimbursable construction	201, 960
Total	$154, 865, 329

[1] Excludes forest highway construction under State supervision.
[2] Excludes defense access roads supervised by other than Public Roads.
[3] Excludes Federal-aid highway construction under State supervision.
[4] Across the Potomac River south of Washington, D.C.

A brief coverage of some of the significant activities under the direct supervision of Public Roads is presented in the following paragraphs.

Forest highways

The forest highway system, which is composed of main and secondary roads within or adjacent to the national forests, had a total length of 24,958 miles at the close of the fiscal year. It is located in 40 States and in Puerto Rico. Although this system is not wholly connected as is the case of the Federal-aid primary highway system, its routes are the principal means of transportation into and through the national forest areas which comprise approximately 181 million acres. Table 20 of the appendix shows, by forest road class, the system mileage in each State. More than half the total length of the system is located in 13 western States, and 88 percent of the total system length is coincident with the Federal-aid primary and secondary highway systems.

On May 26, 1961, revised regulations for administering forest highways were issued, representing the first major revision in 10 years. While some changes of substance were effected, most of the changes were technical, designed to bring the regulations into line with present law and procedures.

Construction operations on the forest highway system in the Western States, which are financed largely by forest highway funds, are generally administered directly by Public Roads. In the East, where the apportionment of forest highway funds to any one State is relatively small and is generally supplemented by

This improvement of U.S. 97, the Blewett Pass Highway in Wenatchee National Forest, south of Leavenworth, Wash., was built with Forest highway funds.

Federal aid, State, and/or local funds, the construction is usually administered by the State highway department.

During the fiscal year 92 percent of all work completed on the forest highway system was under the direct supervision of Public Roads. This work entailed improvements on 350 miles involving $24 million of Federal funds. At the close of the year, additional improvements (under the direct supervision of Public Roads) were underway on 473 miles involving Federal funds totaling $39 million. Some of the improvements completed or underway during the past year are described in the following paragraphs.

Oregon Coast Highway.—The construction of a 7-mile section on the Oregon Coast Highway in northern Lincoln County will replace a substandard 11-mile portion constructed over 30 years ago. The new location crosses a headland of the Pacific Ocean through a cut which was more than 200 feet in depth. More than 3.8 million cubic yards of excavation are involved in this entire section. Construction has been in progress since 1956 and will be completed in the 1962 construction season at a cost of $3.6 million. Extremely wet conditions and the heavy excavation presented many unique problems. Slides were encountered and nearly 3 miles of perforated underdrain were placed under the embankments. The average daily traffic in this area in 1960 varied from 1,200 to 3,250 with heavy tourist traffic during the summer months. It is estimated that the new section when completed will result in annual savings to traffic of $350,000.

Lewis and Clark Highway.—Construction on the historic 135-mile Lewis and Clark Highway, which extends from Kooskia, Idaho, to Lolo, Mont., has been greatly accelerated during the past few years. Since 1918 Federal and State expenditures on the 100-mile Idaho section of the route have amounted to $11.9 million. The recent accelerated schedule was made possible largely through the

allocation of Federal lands highway funds totaling $3,427,000 during fiscal years 1957–61. At the close of the year, three projects 74 miles in length were under construction in Idaho. Included in this work were 13 miles of grading and 61 miles of gravel surfacing of which 39 miles are scheduled to receive a bituminous surface treatment. This work was estimated to cost $2.5 million. Additional funds were programed for placing a bituminous plantmix surface on 39 miles at the easterly end of the route. When this entire route becomes available for use, substantial savings will be realized in travel distance between the principal cities in this area. The distance from Lewiston, Idaho, to Missoula, Mont., for example, will be 80 miles shorter than the present main travel route.

Alaska.—The principal contracts awarded in Alaska during the year for the construction of forest highways involved an extension of the Mitkof Highway (an eventual link by way of the Stikine River to the Canadian highway system), reconstruction and extension of the Glacier Highway north of Juneau, and the extension of the Tongass Highway north of Ketchikan. Construction was completed during the year on a total of 15 miles of forest highways in Alaska, involving Federal funds totaling $2.2 million. At the close of the year, 32 miles were under construction with costs involving $6.6 million of Federal funds. At the beginning of the year, the State of Alaska assumed full responsibility for the maintenance of its forest highways. This function previously was performed by Public Roads.

National park highways, park approach roads, and parkways

Construction or improvement of highways within or approaching national parks or monuments, and of parkways specifically designated by legislation, is financed by funds appropriated to the Department of the Interior. These funds are administered under regulations jointly approved by the Secretary of the Interior and the Secretary of Commerce. The Bureau of Public Roads collaborates with the National Park Service of the Department of the Interior in establishing road systems and developing annual programs. In accordance with a longstanding policy, Public Roads engineers make surveys, prepare plans, and supervise the construction of the major projects on these road systems.

During the fiscal year, improvements were completed on 178 miles of park roads and parkways, involving Federal funds totaling $14.5 million. At the end of the year, additional improvements were underway on 344 miles involving $39.8 million of Federal funds. Table 21 of the appendix indicates the general locations of this construction activity. Some typical improvements are described in the following paragraphs.

Blue Ridge Parkway.—During the fiscal year, construction was completed on 46 miles of the Blue Ridge Parkway with Federal funds totaling $2.6 million. At the close of the year, additional work was underway on 40 miles involving $10.9 million of Federal funds. This scenic 477-mile parkway in Virginia and North Carolina was approximately 83 percent complete. It was open to traffic from its northern terminus at the Shenandoah National Park to U.S. 70 near Asheville, N.C., a distance of 392 miles, except for two short gaps totaling 22 miles. A 15-mile section at the southerly end of the parkway and an 11-mile segment 25 miles south of Asheville were also completed.

George Washington Memorial Parkway.—Construction continued on this parkway which is located on both sides of the Potomac River near Washington, D.C. During the fiscal year, on the Virginia portion, grading was completed from the Central Intelligence Agency office building to the Circumferential Highway (Capital Beltway). Two bridges within this section were incomplete at the close of the year. Southerly from Washington (also in Virginia), a short section approaching the entrance to Washington National Airport was widened

from 4 to 6 traffic lanes. A contract was awarded for further improvement on a 3.2-mile section of the parkway southerly from this point. On the Maryland side of the river, northerly from Washington, grading was completed on a 1.3-mile section. Grading on another 3.0-mile section was underway and three contracts were awarded during the year for the construction of several major structures.

Natchez Trace Parkway.—Considerable activity continued on this parkway in Alabama, Mississippi, and Tennessee during the fiscal year. Construction was completed on a total of 58 miles involving grading, numerous bridges, and surfacing at a cost of $4.2 million. At the close of the year, there were contracts totaling $5.5 million for additional construction on 80 miles of the parkway. Included in this work were 52 miles of bituminous concrete pavement. Upon completion of this surfacing, 163 miles of continuous pavement in Mississippi (from U.S. 45 north of Tupelo to U.S. 51 north of Jackson) will be available for public use. An important project initiated on this parkway during the year was the construction of the Tennessee River Bridge near Florence, Ala. This structure will have an overall length of 5,066 feet. Contracts totaling $2.6 million were awarded to provide the bridge piers, abutments, and steel superstructure. A subsequent contract will provide for the concrete deck and other work. The bridge is scheduled for completion in 1963.

Mt. McKinley National Park.—Proposed construction in this national park in Alaska consists of improving an existing road extending from the Alaska Railroad crossing to the vicinity of Wonder Lake, a distance of 89 miles. At the beginning of the fiscal year, a dust palliative treatment was applied to a 14-mile section. Contracts underway or awarded during the year provided for grading, draining, and the construction of a base course and application of a bituminous prime coat on an adjacent 13-mile section.

Federal-aid activities in Alaska under Public Roads supervision

Prior to this fiscal year the Bureau of Public Roads directly supervised the survey, design, and construction of projects under Alaska's Federal-aid highway program. On July 1, 1960, the State assumed responsibility for directly supervising all highway functions under its Federal-aid program except for the construction of 25 projects which had previously been initiated by Public Roads. These projects remained under the direct supervision of Public Roads and 22 were completed during the year, involving work on 56 miles at a cost of $6.5 million. Construction on the three remaining projects was well advanced or nearing completion.

Bureau of Land Management roads

Public Roads continued to provide engineering services for the Bureau of Land Management of the Department of the Interior in its program of road construction in Oregon by making surveys, preparing plans, and supervising the construction of roads providing access to areas for logging operations. During the year, construction was completed on 90 miles involving Federal funds totaling $3.0 million. At the close of the year, 214 additional miles were under construction involving $8.1 million of Federal funds. Since the roads constructed under Public Roads supervision and those feeder roads constructed by logging companies are not on a county or State road system, necessary maintenance operations were performed by Public Roads as requested by the Bureau of Land Management. During the year Public Roads maintained 265 miles of roads constructed under its supervision and 835 miles of feeder roads constructed by others at a cost of $590,224.

Forest development roads

Public Roads, at the request of the Forest Service, makes surveys, prepares plans and specifications, and supervises construction of roads within national forests which are of primary importance in the protection, administration, and utilization of the forests, or which are necessary for the use and development of the resources upon which the communities within or adjacent to the national forests are dependent. During the year, construction under Public Roads supervision was completed on 33 miles of forest development roads involving Federal funds totaling $2.4 million. At the close of the year, 30 additional miles were under construction at an estimated cost of $2.1 million.

Woodrow Wilson Memorial Bridge

Construction on the Woodrow Wilson Memorial Bridge across the Potomac River south of Washington, D.C., begun in 1958, was nearing completion. The construction of this 5,900-foot bridge, a vital link in the Washington Circumferential Highway (Capital Beltway), has involved 11 contracts totaling $12.7 million. At the end of the fiscal year the work remaining to be completed consisted of the concrete deck and bridge railing, bituminous concrete surfacing on the approach spans, bridge lighting, and painting of steel. The bridge is scheduled for opening to traffic late in 1961.

Public lands highways

Federal-aid acts since 1950 have provided funds to assist the States in developing main roads through unappropriated or unreserved public lands, nontaxable Indian lands, or other Federal reservations. These funds have been allocated on the basis of need to specific projects in 18 States.

The $3.5 million authorized for the fiscal year 1962 was allocated to 11 projects in 9 States. The larger projects on which construction was initiated were the Richard Sims–Dukes Creek Falls road in Georgia, the Red Lodge–Cooke City highway in Montana and Wyoming, the Yellowtail Dam access road in Montana, the Gila Cliff Dwellings National Monument road in New Mexico, the Quinault River bridge in Washington, and the Mountain View–Lonetree road in Wyoming.

New standard specifications for construction

Revision of Public Roads' *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects* was completed and the new edition, designated as *FP–61*, was published in May 1961. It supersedes the 1957 edition (*FP–57*). These specifications are used by Public Roads on construction under its direct supervision, and by various other Government agencies. The revised specifications are the product of the coordinated efforts of Public Roads, other Federal agencies, and national technical and industrial associations interested in highway construction.

Highway Planning and Design

Public Roads engineers continued their close collaboration with the State highway departments in evolving suitable designs, particularly for freeway facilities in urban areas where the situation is often complex because of large traffic volumes, costly right-of-way, and the need for providing local service. The State highway departments were emphasizing the selection of appropriate interchange types and proper interchange spacing, in order to provide good operation, to avoid excessive costs, and to accommodate the expected future traffic volumes.

In rural areas there was an increasing use of independent roadway design in

which each of the two roadways of a divided highway is designed as a separate unit, resulting in variable widths of median areas and variations in the adjacent grades. This concept, when properly applied in rural areas having rolling or hilly terrain, often provides an economical design and at the same time offers a safer facility and one which is more attractive to the highway users.

Experience gained on an increasing mileage of freeways in operation was leading to further refinements and improvements in the geometric design of through lanes and interchanges. On high-type highways there was a trend toward the use of continuous and full-width paved shoulders. Longer speed-change lanes at ramp terminals were being built and frequently were being designed as tapered areas for diverging and merging movements, rather than as auxiliary lanes placed alongside the through pavement. Attention was being directed to the development of layouts that will avoid major weaving movements across the through traffic lanes.

Although overall standards for freeway design were well established, the State highway departments, with the cooperation of Public Roads, were demonstrating a sustained interest in taking full advantage of all new information concerning freeway operation that may affect design details.

Urban planning

The efficient movement of traffic on the Interstate System and to and from the System interchanges in urban areas has been of particular concern to highway engineers and municipal authorities. To explore the coordination of highway planning with the economic and social development of municipalities, Public Roads surveyed the availability and types of urban plans. The inventory indicated that practically all of the larger cities and the majority of the smaller cities had either a comprehensive, transportation, or arterial highway plan to guide highway engineers in the selection of routes for major arterial highways. Over two-thirds of these community plans were less than 3 years old and over four-fifths were less than 5 years old. Activity in this continuing process of urban planning has been promoted by Public Roads as an essential foundation for proper highway location and design.

Cooperation among Federal agencies concerned with highway and urban renewal planning and other urban planning work, already well established, was strengthened during the year through additional joint action of the Department of Commerce and the Housing and Home Finance Agency. The operating bureaus concerned, the Bureau of Public Roads and the Urban Renewal Administration, entered into further formal coordination of their interrelated planning projects in urban areas. A joint policy and procedural statement on coordination of highway and general urban planning was issued in November 1960 by the two agencies. New arrangements for coordination and joint financing of comprehensive urban planning studies included the designation of a joint steering committee of Washington office representatives of both agencies and of regional joint steering committees consisting of regional staff officials. Regional meetings were held and procedures established for complete interchange of information between the field offices of the two agencies, and proposals for several joint planning projects were advanced during the year.

Public Roads has been closely associated with many urban area studies. Comprehensive home-interview studies of travel and vehicle use were started in 12 cities during the year, with Public Roads assistance, bringing the total of such studies to 170, of which 29 were repeat surveys. Continuing studies were in progress in Chicago, Detroit, Minneapolis-St. Paul, Pittsburgh, and Washington, D.C. In addition to the home-interview origin and destination studies, several cordon-type roadside interview studies were conducted in smaller cities. Com-

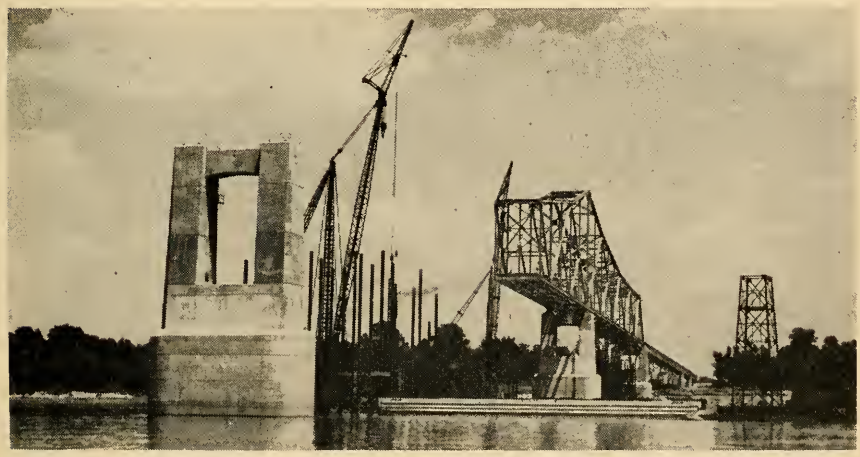
plete parking studies were conducted in Chattanooga, Nashville, and New Orleans. Planning of cooperative studies of traffic characteristics in New York City, the largest metropolitan area in the Nation, approached the agreement stage among the Bureau of Public Roads, the State of New York, and New York City.

Continuing staff assistance was provided by Public Roads to the joint committee on highways of the American Association of State Highway Officials and the American Municipal Association, and to the AASHO urban transportation planning committee. The latter was created following the successful conclusion of the AASHO-sponsored regional seminars for highway officials on urban and transportation planning, held in each of the four AASHO regions and attended by over 250 highway officials including Public Roads personnel. Advisory staff assistance was also furnished by Public Roads to the highway committee of the American Municipal Association, as well as to the suburban committee of the National Association of County Engineers; and staff participation continued in committees of the Highway Research Board and other technical and professional groups.

Public Roads research, described elsewhere in this report, continued to make outstanding contributions to urban planning.

Design guides and policies

Public Roads engineers continued cooperative assistance to the American Association of State Highway Officials committees in the development of additional design guides and policies. During the year AASHO adopted and published a *Policy on Access Between Adjacent Railroads and Interstate Highways.* Work was also completed and publication approved by AASHO on an *Informational Guide on Services to Motorists on Interstate Highways.* This guide reviews the problems of the State highway departments inherent in the operation of the long stretches of Interstate highways now being opened to traffic, with regard to normal services for motorists and vehicles, freeway patrolling by police and maintenance vehicles, and assistance in emergencies. A major suggestion made is that the State highway departments establish units or officials with responsibility for the coordination needed to resolve such problems.



This new Mississippi River bridge at Helena, Ark., will replace an inadequate ferry operation. The nearest existing bridges on the river are 72 miles to the north and 137 miles to the south.

During the year work continued on studies leading toward guides on control of headlight glare on divided highways and on emergency communication devices, including telephones, on freeways. Similar development studies were started on the subject of crossroad design and control of development along crossroads near interchanges, and on geometric design standards for highways other than freeways.

Bridge Design

Public Roads continued its close cooperation with the States in the planning and construction of highway bridges in the Federal-aid program. Public Roads itself designed and constructed bridges for other Federal agencies, and furnished technical assistance on bridge planning and construction for the Inter-American Highway and to eight other foreign countries.

A number of bridges, presently in the design or construction stage in the Federal-aid program, are noteworthy. Truss bridges with maximum span lengths of 700 to 830 feet over the Ohio River at Evansville and at Jeffersonville, Ind., at Louisville, Ky., and at Cincinnati, Ohio, have welded built-up truss members of normal, medium, and high strength structural steels to effect maximum economy. Three bridges over the Mississippi River have unusual features: the bridge at Baton Rouge has a through truss span of 1,200 feet over the main channel; the Poplar Street Bridge at St. Louis utilizes orthotropic design, i.e., the stiffened steel deck plates are integral with the plate girders; and the Washington Avenue Bridge in Minneapolis is double deck with the entire upper deck for pedestrians, to serve the students of the University of Minnesota. The Borro Creek Bridge in Arizona, a 670-foot steel truss arch, was well adapted architecturally and economically to the steep rock walls of the deep gorge.

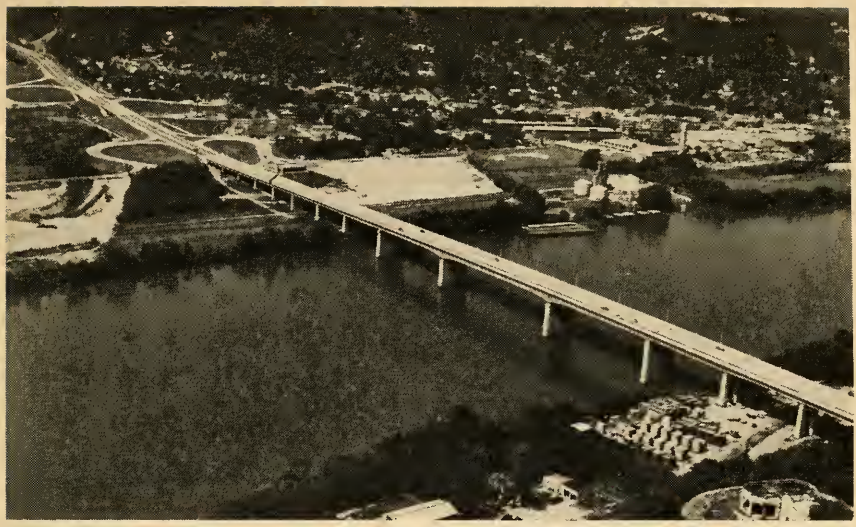
For the Theodore Roosevelt Memorial Bridge across the Potomac River at Washington, D.C., near the Lincoln Memorial, special architectural treatment was given to the lines, proportions, and stone facing of the 15 spans of continuous riveted deck plate girders, to blend the structure with the memorial location.

Two tunnels built with Federal aid were opened to traffic during the year. The twin tube, 4-lane Fort Pitt Tunnel, located in Pittsburgh, was constructed in rock, and has a length of 3,600 feet. In Fort Lauderdale, Fla., a twin cell, 1,850-foot subaqueous tunnel was constructed by cofferdam methods under the New River.

A compilation of new bridge construction during the calendar year 1960 was completed, listing by States and highway systems the number, length, and cost, and percentage of concrete, structural steel, and prestressed concrete bridges.

Promotion of the appropriate use of two relatively new steels increased their use with resulting economies in bridge construction. Heat treated alloy steels with yield-point values of 90,000–100,000 p.s.i. have been produced by several steel manufacturers as proprietary materials, each controlled by the manufacturer's specifications. Public Roads initiated a conference of the manufacturers and Government engineers which resulted in writing and acceptance of a single specification to cover all of these steels. Public Roads also prepared a criteria for the use of the new steel, ASTM A–36, a steel of the same price as the commonly used ASTM A–7 steel but with a higher yield point and improved chemical controls.

With Public Roads assistance AASHO adopted and published a *Specification for the Design and Construction of Structural Supports for Highway Signs.*



The Olgiati Bridge over the Tennessee River at Chattanooga, Tenn., built with Federal-aid funds, links a series of improvements on Interstate Route 124 and U.S. 27. The old Market Street Bridge nearby was a focus of frequent traffic jams.

The specification presents advanced methods for determining wind loads on signs and for the analysis of their effects, and includes new recommendations for design stresses in certain aluminum alloys.

Public Roads participated in a cooperative investigation of reinforced concrete bridge decks with the Portland Cement Association and several State highway departments, seeking to determine the causes and extent of deck deterioration in selected areas and to find means of improving service life on future construction.

Public Roads participation in research in structural problems connected with bridges continued during the year, as described elsewhere in this report.

Two publications for use in the design of drainage structures for highways were issued during the year, *Hydraulics of Bridge Waterways* and *Peak Rates of Runoff from Small Watersheds.* Several hydraulic engineering circulars were also prepared by Public Roads and distributed to State highway departments and other public agencies engaged in highway design and construction. The U.S. Geological Survey has prepared reports (on file at the district offices of the Survey) in cooperation with the States, for estimating the magnitude and frequency of floods in Indiana, Kansas, New York, Pennsylvania, Tennessee, and Wisconsin. Public Roads advocates the use of flood frequency data in the design of bridge waterways to serve a proper balance between cost of the structure and its protection from flood damage.

Seminars on hydraulic problems related to highways were conducted by Public Roads at three field offices in cooperation with the State highway departments.

Right-of-Way Acquisition

Public Roads' statement of policy and procedures with respect to right-of-way acquisition for the Federal-aid programs was revised during the year to clarify the requirements as to right-of-way organizations, policies, and procedures of the State highway departments. With the cooperation of Public

Roads, the great majority of the States have raised their right-of-way organizations to staff level of importance, prepared right-of-way manuals and written procedures for property management, and created a reviewing appraiser function. In addition, many States have effectively developed the use of right-of-way plans and employed aerial photogrammetry for that purpose, established right-of-way training courses, and adopted some form of public relations program in connection with right-of-way acquisition.

Control of Outdoor Advertising on the Interstate System

By the Federal-Aid Highway Act of 1958 the Congress established a national policy on the control of outdoor advertising in areas adjacent to the National System of Interstate and Defense Highways, to be effected in those States that voluntarily enter into an agreement to do so with the Secretary of Commerce. To encourage and assist the States to carry out the national policy, the law provided for an increase of one-half of one percent in the Federal share of the cost of Interstate highway projects in those States which entered into an agreement with the Secretary of Commerce by June 30, 1961.

The first State to enter into such an agreement was Maryland, on January 18, 1961. By expiration of the deadline date, 14 additional States had entered into such an agreement: Connecticut, Delaware, Hawaii, Kentucky, Maine, Nebraska, New York, North Dakota, Ohio, Oregon, Pennsylvania, Washington, West Virginia, and Wisconsin.

Section 106 of the Federal-Aid Highway Act of 1961 extended the time within which the States could qualify for the increased Federal share by 2 years, until July 1, 1963. It is expected that a number of additional States will enact the necessary legislation and enter into agreements with the Secretary of Commerce before the expiration of this new deadline date.

Navigational Clearance Requirements

During the year, Public Roads continued its efforts to obtain reasonable navigation clearances at highway crossings of the Nation's navigable streams. Notwithstanding many difficulties, a construction cost saving of approximately

Interstate Route 70 is carried across the Missouri River on this new bridge west of Columbia, Mo.

$7.5 million was accomplished during the year. This work was not as successful as it had been in past years due to the fact that legislation was introduced into the Congress during the year that would have the effect of canceling recent favorable decisions by the Corps of Engineers on the vertical guide clearances to be required on the upper Mississippi River and the Sacramento River. As a consequence, action on requests for permits to construct bridges across these two streams was suspended, and issuance of revised vertical guide clearance criteria on other streams was delayed. This affected the progress of bridge construction programs on those streams. The legislation was still pending at the close of the year.

During the year Public Roads initiated an effort to obtain the agreement of the Corps of Engineers, the Bureau of Reclamation, and other agencies concerned with the construction of water resources projects to a basic concept that could be used to minimize the inherent conflict between the development of transportation and the development of water resources. Agreement had been reached by the end of the year with the Corps of Engineers on the financing of highways being relocated by a water resources agency coincidental with the construction of the water resources development project, and on the advance construction or reconstruction of highways on locations necessary to preserve authorized reservoir sites.

Highway Roadside Development

Public Roads, in cooperation with committees of the American Association of State Highway Officials, continued work on the preparation of guide standards for roadside improvement as a means of implementing the AASHO policy on landscape development. Such cooperative work included study of the control of headlight glare by planting and other methods.

Staff specialists cooperated with the State highway departments and with manufacturers in the experimental use of new materials for protection against erosion, including glass fiber blankets and materials produced by the paper, jute, and chemical industries.

Special roadside studies were continued under cooperative agreements with State highway departments and universities in the selection, use, and development of plant materials and equipment for more effective and economical roadside development and maintenance.

Use of Aerial Surveys

Research was continued in the development of better methods of photogrammetrically obtaining profile and cross-section data and using such data in electronic computers. An experimental electronic-photogrammetric measuring and map compilation instrument was successfully developed in cooperation with an electronic engineering firm.

Two studies were undertaken to learn the feasibilities and possible accuracies attainable with double-projection stereoplotting instruments. One of these was designed to test horizontal and vertical control bridging by aerial triangulation, using various scales of aerial photography. The other compared the volumes of earthwork computed from profile and cross-section data obtained by field surveys and by photogrammetric methods on grading projects in a mountainous area. At the request of the Department of Defense a project was undertaken by aerial survey methods to compile topographic maps and to design thereon a primitive, circuitous, and steep road system for driver training of military personnel.

A comprehensive paper, *The Role of Aerial Surveys in Highway Engineering*, was presented at the Ninth International Congress of Photogrammetry at Lon-

don, England, in September 1960, and was subsequently published. Training in aerial survey methods was given to Public Roads engineers and highway engineers from other countries, and assistance was provided to a number of State highway departments.

Highway Needs of the National Defense

Public Roads continued to work in close cooperation with the Department of Defense on all matters of joint interest. These matters included resolution of problems on major highway locations in the vicinity of military installations having special clearance requirements; coordination of unusual military vehicle design and highway design; identification of routes for special defense shipments; selection of routes to be developed or preserved with special vertical clearance requirements around large urban areas, and as connectors between Interstate routes and major ports; and arranging for improvement of public roads needed to provide adequate highway service to defense installations and activities.

Public Roads has also cooperated with the Office of Civil and Defense Mobilization while making substantial gains in operational readiness throughout the highway field to meet a national emergency.

Noteworthy is the three-way cooperation developed among Public Roads, the Department of Defense, and the Office of Civil and Defense Mobilization in formulation of plans for highway traffic regulation in an emergency, which would have uniform application in areas under either military or civilian jurisdiction.

Defense access, replacement, and maneuver roads

State and local highway departments continued to cooperate with Public Roads in making improvements needed to provide adequate highway service to defense installations and activities. Certain of these improvements which cannot be accomplished appropriately under regular highway programs are handled under the defense access, replacement, and maneuver road program. Funds transferred from defense agencies are used to finance this work. Plans, surveys, and estimates and supervision of construction are generally handled by State highway departments on substantially the same basis as regular Federal-aid highway programs. A relatively small portion of the work is also handled under direct supervision of Public Roads.

During the fiscal year, funds transferred by the Department of Defense included $4,281,340 from the Department of the Army, $1,596,296 from the Department of the Navy, and $10,032,014 from the Department of the Air Force, a total of $15,909,650. This increased the total funds transferred by these three departments since 1956 to $86,489,187. The Atomic Energy Commission also transferred $375,000 to finance two projects. These transfers increased the total made available for defense access, replacement, and maneuver roads since the beginning of the Korean emergency to $147,713,674.

During the fiscal year 69 projects serving defense installations were completely financed at a total estimated cost of $14.4 million, with $14.0 million financed from funds transferred by the Department of Defense and the AEC. Preliminary engineering in the amount of $9,500 was programed on four additional defense projects having a cost of $289,500. At the close of the year, there were 13 unfinanced projects having an estimated total cost of $8.4 million and requiring $7.1 million of defense access-road funds, certified as important to the national defense. An additional 11 projects, estimated to cost $2.5 million, were awaiting certification by the Department of Defense. The access-road needs of 16 other installations were under evaluation by Public Roads.

Public Roads completed the evaluation of access-road needs of 114 ICBM Atlas and Titan sites located in the vicinity of 9 air bases. The estimated cost of access roads at the 37 sites requiring improvements was $3.4 million. Construction of the access roads at five of the bases was substantially completed during the fiscal year, and construction at two other bases was well underway.

Public Roads accomplished an urgent and high priority defense project providing for immediate improvement of existing traveled public highways to serve the site contractor's heavy hauling to 150 ICBM Minuteman sites and 15 control centers located in the vicinity of Malmstrom Air Force Base, Great Falls, Mont. This work extended over 19,250 square miles in 7 counties. The project provided for placing a gravel surface on 168 miles of roads; spot reinforcement of an additional 30 miles; strengthening of 138 bridges; and placing 90 pipe culverts having a total length of 3,164 feet. All work was accomplished by contract under Public Roads supervision within a period of 63 days, under a cost-plus-fixed-fee contract at a total cost of $716,000. In addition, three projects providing for permanent improvements on 617 miles of access roads to these sites were programed.

Similar emergency haul-road construction on 325 miles estimated to cost $1.1 million and evaluation of defense access-road needs of 150 sites and 15 control centers at Ellsworth Air Force Base, Rapid City, S. Dak., were in progress at the close of the fiscal year. During the year an additional 226 miles of haul road were improved at a cost of $77,672 to expedite the construction of Titan sites at air bases near Little Rock, Ark., and Wichita, Kans. Public Roads also completed condition surveys of haul roads to be used by contractors for the missile sites near Great Falls, Little Rock, and Wichita. These surveys were made to assist military contracting authorities and local highway agencies in settling claims which might develop for damage resulting from the contractors' operations.

Emergency planning and mobilization readiness

The Bureau of Public Roads accepted, in September 1960, the definition of the role and responsibilities of State highway departments in connection with civil and defense mobilization as they were approved at that time by the American Association of State Highway Officials. The role and responsibilities, thus recognized, facilitate cooperative effort aimed jointly by Public Roads and State highway departments toward attaining an adequate state of readiness to perform such emergency duties as they are most competent to perform in association one with the other. Responsibilities assigned to Public Roads by the Office of Civil and Defense Mobilization during the year confirmed and clarified previous authorities, and strengthened Public Roads' position in working cooperatively with the State highway departments.

Considerable progress was made by a number of State highway departments in their efforts to bring about the revision and updating of the State civil defense survival plans, to provide a more effective and meaningful role for State highway departments in an emergency. Public Roads guidance and the attention given to emergency planning by the American Association of State Highway Officials contributed to the progress made. Final action was taken during the year on the program of standardizing a series of highway signs for use in an emergency. The National Joint Committee on Uniform Traffic Control Devices approved the series of signs during the year and included them in the *Manual on Uniform Traffic Control Devices.*

Under Public Roads guidance 14 State highway departments prepared procedures to monitor highways to determine the degree of contamination by radioactive fallout caused by nuclear weapons. During the year, State highway

departments continued the training of employees in radiological monitoring. By the spring of 1961 the States had 432 instructors and 6,258 trained monitors. Procedures to regulate highway traffic in contaminated areas were developed by 15 States of which 7 had been approved by the end of the year. The concurrence by the Department of Defense in the Public Roads emergency traffic regulation procedure contributed to the progress made with this program.

Additional relocation sites were established by Public Roads for its own field offices and existing sites were strengthened during the year.

Highway Safety

Public Roads continued its activities in the study and promotion of highway safety during the year. Much of the research work and design improvement discussed elsewhere in this report are directly concerned with highway safety or, through the facilitation of smooth traffic flow, enhance safety indirectly.

Public Roads cooperated with the President's Committee for Traffic Safety in its major accomplishment of the year, the first complete revision of the action program for traffic safety since 1949. Individual reports in the new action program cover education, engineering, laws and ordinances, motor-vehicle administration, organized citizen support, police traffic supervision, public information, traffic accident records, and traffic courts. Two other reports were being prepared, on research and on the health and medical care aspects of traffic safety.

To step up effective application of the proved traffic safety measures of the action program, a 5-year plan was developed to focus efforts of the 35 national organizations cooperating with the Committee in meeting greatest needs. In the second major area of Committee activity—development of organized citizen support for official action—more than half of the States now have statewide, full-time staff organizations and more than 50 percent of the cities of 100,000 or more population have safety councils or equivalent community-wide organizations with full-time staffs. The activities of these organized groups cover more than two-thirds of the Nation's population.

Due to the vast road and vehicle improvement accomplishments and the growing safety promotion efforts made since the close of World War II, American motorists in the aggregate can now travel 75 percent further without a traffic death: the record was 1.9 million vehicle-miles of travel per traffic fatality in 1960 as compared with 1.0 million vehicle-miles per fatality 14 years earlier. Put in more conventional terms, there were 5.3 traffic fatalities per 100 million vehicle-miles of travel in calendar year 1960 as compared with 5.4 fatalities in 1959 and 9.8 in 1946. The total number of fatalities has increased from 33,400 per year to 38,200 during this 14-year period, but at the same time the number of registered motor vehicles and the miles they travel annually has more than doubled.

National Driver Register Service

A new responsibility of the Bureau of Public Roads is the operation of the National Driver Register Service. Proposed in a 1959 report to Congress on highway safety, operation of the register was authorized by Federal legislation approved July 14, 1960. The driver register was planned to be a file on motor-vehicle operators whose driving privileges have been withdrawn by a State or political subdivision for driving while intoxicated or for conviction of a violation involving a traffic fatality.

The program was to be a purely voluntary, cooperative State-Federal enterprise. The States that make use of the register will supply to Public Roads

names and identifying data on drivers whose driving privileges have been withdrawn for the specified causes, and will request a check on new license applicants against the register files. By this means the States will be able to prevent, or at least reduce the possibility, of the inadvertent granting of driver privileges to individuals whose licenses have been withdrawn in another State and whose operation of a motor vehicle would be likely to create a disproportionate hazard to other highway users. The information from the register will be available only to the States and their political subdivisions.

During the year, planning conferences were held concerning the establishment of the register with the American Association of Motor Vehicle Administrators, the International Association of Chiefs of Police, the American Bar Association, and other groups, as well as with the individual States. Problems of operation were studied, and it was found that much of the work could be handled with Public Roads' own electronic data processing equipment by using it on a night shift. Tabulating card preparation was contracted to the Bureau of the Census. Forms and instructions were prepared and distributed to the States.

The register service was set in operation on June 30, 1961. At that time 43 States and 4 territories had agreed to participate and had already sent in information on 12,000 drivers. It is anticipated that records may be received on 1,000 names daily, and requests for searches could well average 20,000 a day, when the operation reaches full stride.

Administration and Management

Public Roads' financial management improvement program was further advanced during the fiscal year by issuance of an accounting system manual and an audit manual, streamlining of procedures for audit of State claims for reimbursement, strengthening of administrative field organizations, and decentralization of authority to approve States' claims for reimbursement. Pilot testing of new audit techniques, using statistical sampling concepts, was initiated.

A comprehensive study of expanding needs for automatic computing facilities resulted in replacement of Public Roads' medium-sized card computer system by a medium-scale computer with magnetic tape units. Computer programs were being developed to use the greater potential of the new equipment in many engineering, research, and administrative activities.

In the face of the ever-increasing workload generated by acceleration of the highway program, a reappraisal of manpower needs in reasonable proportion to growing program demands became necessary. During the year, a manpower utilization study was begun to develop realistic performance and workload measurement criteria to determine manpower needs and to provide the basis for longer range and more extensive manpower planning and development related to the demands of the highway program.

Significant progress was made in the development and application of in-service and out-service training programs for Public Roads personnel.

Plans for development of a State highway organization in Alaska were approved for the transition from Federal to State operation of the highway program effective July 1, 1960. Staffing of this new organization was accomplished by the transfer of Public Roads Alaska Region personnel originally acquired in the transfer from the former Alaska Road Commission of the Department of the Interior. The Public Roads Alaska Regional Office was reorganized at the same time to conform with the basic organization plan of the Bureau for normal Federal-State operations.

A project examination division was established in the Bureau of Public Roads in 1957 to maintain administrative vigilance over all aspects of the programs administered by Public Roads, from the standpoint of adherence to legislative

requirement, proper utilization of Federal funds, and overall effectiveness of the Public Roads organization and operations. During the year, review teams, composed of engineers, real property officers, auditors, and investigators, conducted reviews in Alabama, Arizona, Colorado, Florida, Louisiana, Maryland, Michigan, Pennsylvania, Washington, Wisconsin, and Puerto Rico. A number of special inquiries into allegations of irregularities or malpractices in the highway program were conducted during the year and the results were referred to the Department of Justice where appropriate.

Development of New Practices

Electronic computers

During the fiscal year substantial progress was made in further extending the use of electronic computation in highway engineering and administration. Particular attention was being directed to further refining the highway location and design process leading toward a comprehensive electronic computer procedure for determining the optimum plan from among feasible alternative proposals through highway user benefit-cost analysis. The Public Roads electronic computer program library had grown to 400 computer programs covering all phases of highway engineering. Three additional programs were converted to universally usable form, making a total of 30 such programs available. One of these makes possible the evaluation of alternative plans for urban street and freeway networks to determine the optimum system in terms of traffic anticipated during a number of years in the future.

Public Roads completed a study of the engineering and administrative operations of the District of Columbia Department of Highways and Traffic, undertaken at their request, to determine the economic feasibility of conversion of various operations to electronic computation. The New York State Department of Public Works requested a similar study. An intensive training course in the use of computers in bridge design was conducted for a number of engineers of the Virginia Department of Highways. A similar course was planned for Public Roads Region 2 bridge engineers, and further extension of training of this kind was anticipated.

Equipment development and use

Public Roads continued to encourage the development and use of new equipment for highway construction and maintenance. Among promising equipment developments closely followed by Public Roads was automatic profile grade control for bituminous paver-finishers. One electronic device enables the paver to follow automatically a single wire or other grade reference placed outside the pavement edge. A prototype model has also been successfully operated on resurfacing work, using long skids as a reference in smoothing out undulations in the old pavement. Another grade-following system in the development stage used an infrared light as a profile reference on tangents. Perfection of such automatic grade-following systems, and others under development, will improve pavement riding qualities and permit the construction of an accurately layered pavement structure closely conforming to design thickness.

Another promising development being observed and already job tested in several States was an infrared joint heater attachment for asphalt paver-finishers. This device will assure the bonding and weatherproofing of longitudinal joints between adjacent surface courses. The heater uses a propane fuel and operates on the principle that dark materials (such as bitumens) absorb infrared energy which is converted into heat, softening the cold material so that it can be tightly bonded and smoothly compacted into a monolithic surface.

Progress was made during the year in eliminating restrictive equipment requirements in construction specifications. An increased number of States adopted the tire ground-contact pressure method of rating pneumatic rollers used in base and surface compaction. This will allow equipment manufacturers to compete in the roller market on the basis of actual compacting ability and avoid their elimination from consideration solely on a machine description basis. Greater economy in pavement construction may also be realized.

Considerable progress was also made during the year in reducing mixing time for concrete pavers, both by better adherence to the accepted 60-second mixing time and by recognition that transfer time in multi-compartment pavers should not be excluded from mixing time. The joint subcommittee on mixing time of the American Association of State Highway Officials and the American Road Builders Association, on which Public Roads was represented, assisted in this trend by developing a revision of the AASHO standard specification for concrete pavement construction which deals with on-site mixing. The joint subcommittee also developed an interim mixing time criterion for hot bituminous concrete. Both of these criteria have been approved by the AASHO executive committee and recommended for inclusion in construction manuals and specifications. Adoption of these criteria can result in substantial savings in processing such paving materials while at the same time providing for equal or better quality roadway surfaces. Work continued in the concrete mixing-time field for central mixing plants and transit-mix trucks, with the objectives of reducing excessive mixing time and obtaining better uniformity in other related construction requirements.

Improvement of criteria for compaction was advanced through leadership of Public Roads and the joint AASHO–ARBA subcommittee on compaction to the stage of approval by the AASHO executive committee. It is expected that implementation of these more modern and realistic determinations will be effected through the AASHO committee on construction by inclusion of these upgraded criteria in appropriate AASHO manuals and specifications.

Public Roads continued to provide leadership in efforts of nationwide scope to upgrade and update State highway department construction specifications. Primary objectives were to eliminate or broaden unduly restrictive requirements so as to make possible fuller realization of the capabilities of modern developments in highway construction equipment, materials, procedures, and operations, resulting in greater economy or better construction. An example was the entry of aluminum into competitive usage for corrugated pipe culverts.

Procedures

Public Roads continued to promote acceptance among State highway departments of the use of reduced-size plans and the microfilming of plan records. These economy-effecting developments have been advanced to the stage where 40 States were using reduced-size prints and 29 States were using microfilm for plan records or for other related purposes. Closely associated with these was the comparatively more recent development of a unitized microfilm and punch-card method of information storage and retrieval. Public Roads promotional activity to expand acceptance of this newer economy-effecting measure was underway.

Nuclear energy

Public Roads continued to advance new techniques in highway operations through the use of nuclear energy for nondestructive testing, control of materials, self-luminous highway signs, and for tracing materials. The determination of moisture and density in the control of embankment and base-course com-

paction and the measuring of the quality and consistency of highway pavements and structures of all types was, during the fiscal year 1961, the most advanced nuclear technique. Public Roads found that 39 States were using or had explored the use of nuclear energy for moisture-density determinations. Public Roads worked closely with several universities and manufacturers in the development of moisture-density gage instruments and with many State highway departments on the use of these gages during the year.

California, in cooperation with Public Roads, undertook the development of a nuclear energized self-luminous highway sign. The development of an economically feasible self-luminous sign would be of great importance in connection with the signing requirements for the Interstate System and other expressways.

Public Roads was preparing the advancement of an ultrasonic system for nondestructive testing, particularly for measuring the thickness of bituminous and portland cement concrete pavements. Such a device should be capable not only of determining thickness at a point, but of providing a continuous thickness record as it is moved along the highway.

Experimental projects

In cooperation with State highway departments and others, Public Roads continued to sponsor experimental highway projects using new materials and new construction methods. During the fiscal year, 220 experimental projects were active and involved 40 different experimental features. Summaries were being prepared concerning the use of lime in bituminous mixtures and for stabilizing subbases and subgrades, and on prestressed concrete pavements. A guide specification for rubberized asphalt was established. Work was underway on a revision of a summary on continuously reinforced concrete pavement, which promises to further standardize this relatively new type design. Several experimental continuously reinforced concrete pavement projects were initiated and the new design and construction techniques employed promise to supply useful information. The experimental use of asbestos fibers in bituminous mixes was encouraged and promising results may materialize.

AASHO Road Test

Field work was completed during the year on the largest highway research project ever undertaken—the $27 million AASHO Road Test conducted near Ottawa, Ill. The test facility, comprising a huge outdoor research laboratory, was provided to study the behavior of pavements of varied composition and thickness and bridges of varied design under the application of controlled weights and frequencies of traffic. Test traffic started on October 15, 1958, and was terminated on November 30, 1960. In the interim, the test vehicles had traveled altogether more than 17 million miles and the planned application of 1.1 million axle loads to surviving test sections had been realized.

Conceived in the early 1950's, the road test was sponsored by the American Association of State Highway Officials and administered by the Highway Research Board. Grants and services were provided by the State highway departments, the Automobile Manufacturers Association, the American Petroleum Institute, the American Institute of Steel Construction, the Department of Defense, and the Bureau of Public Roads.

From December 1960 through late spring 1961, special studies were conducted to determine the effects of weather and climate, fatigue of construction materials, load-strain and deflection variations, the relation of tire load, tire size, and inflation pressure, the dynamic effects of heavy military and special vehicles on both pavements and bridges, and trench studies to ascertain the post-test condition of the test sections.

The 5-year research project has produced a wealth of information which will be embodied in a series of seven reports to be published by the Highway Research Board. The first, a history and description of the project, was being printed. The second report, being completed, deals with the test facilities and their construction. Ensuing reports are expected to cover operations and maintenance, bridge research, pavement research, and the special studies. It was anticipated that all of these reports, and a summary report,would be in the hands of the review committees by August 1961.

The AASHO Road Test findings will have enduring application to problems of motor-vehicle size and weight regulation, in determination of the economics of motor-vehicle sizes and weights, in development of improved design procedures, and in the upgrading of standards and service capabilities of existing highways. However, the results will not be directly applicable to pavement design in many areas because of local differences in such factors as soils, climatic conditions, and traffic composition. Cooperative "satellite" studies for translation of results of the AASHO Road Test to local conditions have been initiated in Florida and North Carolina, and several other States are planning similar studies. These studies will, of course, be on a much lesser scale than the AASHO Road Test, and will be conducted on highway sections subjected to normal traffic usage but built especially for test purposes.

At year's end, plans were well underway for the rehabilitation and reconstruction of the Test Road in Illinois and its conversion into a section of the Interstate System, as originally planned. Special test sections will be incorporated into the converted highway for continued study of behavior under normal traffic, thus providing, in effect, one of the satellite tests.

Highway Planning Research

Urban highway research

Research during the year was directed toward the continuing development of basic data, techniques, and procedures for a rational process of comprehensive urban transportation planning; in particular those related to estimating the future travel demands of our increasing urban population.

A report was published describing a study of the nature of travel to a regional shopping center. The study revealed the additional traffic demands placed upon adjacent highway facilities by the development of such centers, and estimated the effect of the regional center upon existing commercial centers within its market area.

Another published report illustrated the distributive pattern of traffic approaching cities of various sizes. In general, it showed that well over 60 percent of the traffic approaching the smallest cities is through traffic, with destinations beyond the city, while for the largest cities less than 10 percent of the approaching traffic wants to go through. The nonthrough traffic, however, is not by any means all destined for the city's central business district. The study illustrates the patterns of approaching traffic distributed to concentric rings of equal breadth in cities of various size groupings and provides guidelines for the development of urban highway systems. It was found that for intracity traffic a general rule of inverse proportion was applicable to central business district trip destinations. In cities of less than 50,000 population only 22 percent of the total individual trips were destined downtown, and this proportion steadily decreased inversely with the size of the city, reaching less than 6 percent for cities over 1 million.

Two urban research projects initiated during the year will attempt to evaluate the effectiveness of inter-area travel formulas in estimating present travel patterns and predicting those of the future. This research is being conducted in

an effort to develop and test standard procedures for using inter-area travel formulas in the transportation planning process. The first project is concerned with developing and evaluating the effectiveness of a "gravity" model formulation for the Washington, D.C., metropolitan area. The gravity model is based on the hypothesis that all trips produced in an area are attracted to other areas, and that the strength of this attraction is directly related to the total number of trips generated in each of the areas and is inversely related to the travel time between the areas. By comparing the model results with an origin-destination transportation study, discrepancies can be analyzed and the effects of various social and economic factors not accounted for by the model can be determined.

The second project initiated, in cooperation with the Pennsylvania Department of Highways, is concerned with a comparison of the effectiveness of two inter-area travel formulas—the gravity model and the opportunity model. The effect of income and occupation grouping will be studied and analyzed, and models of varying degrees of specificity will be developed and evaluated.

Research was continued on a study of about a dozen cities, to evaluate the effect that factors such as income, sex, race, occupation, and density of development have on travel characteristics. The cities being studied have travel data available for two time periods several years apart, so that the effect of time and changing conditions can also be evaluated. The relations developed will aid in planning improved traffic estimation procedures.

Relationship of urban factors to automobile and transit use

Appreciable progress was made in the extension of an equation, developed for predicting use of automobiles and transit in entire urban areas, to use for smaller area segments. Through testing modifications of the general equation, using data for subdivisions in several cities, the prediction reliability was considerably increased. Development of the relation between the parking supply factor and automobile and transit use was proceeding through analysis of data gathered in Washington, D.C., beginning with 1955. Additional research has also increased the reliability of methods for estimating absolute transit use.

Traffic assignment

The library of electronic computer programs developed by Public Roads for assigning traffic to an urban highway network was again used to a great extent during the year in a number of cities. Aid was extended to several State highway departments in adapting the assignment programs to both large and medium-size computers.

The most significant addition to the traffic assignment program library was a procedure for modifying resulting assignments in relation to either measured volumes or capacity. If, for example, a proposed freeway section has a capacity of 6,000 vehicles per hour, and an initial assignment loaded this section with 7,600 vehicles during the peak hour, it would be desirable to divert the overload to parallel routes. The new procedure automatically adjusts the travel time on each section of the highway network in relation to the ratio between assigned volume and either measured volume or capacity. If the assigned volume on a section of highway is too high, the travel time is automatically increased; if the volume is too low, the travel time is automatically decreased. A subsequent assignment is then made with the adjusted times, thereby resulting in a rerouting of a portion of the traffic.

Computer programs were developed to adapt the output of the traffic assignment program to direct use on automatic plotting equipment. One program allows the automatic plotting of a "tree," which is the minimum route between all points in the city and a given zone. Plotting such a tree manually takes

about 2 man-days; the automatic plotter will accomplish this work in less than 2 hours. A program for plotting the volumes assigned to each section of a highway network was also written.

Work was completed on a procedure for automatic coding of origins and destinations on an electronic computer, and on a study comparing airline distances with travel times reported in an origin and destination survey. Work was started on a general electronic computer program for editing origin and destination survey cards and rearranging data into a standard output format for further processing. Work was continued on the comparison of various traffic forecasting procedures.

Traffic volume, classification, and weight information

Traffic data for more than 1,600 continuous traffic-count stations in all States were analyzed during the year to develop the trends in highway traffic volumes. Highway travel on all roads and streets increased by 2.6 percent during the year. The travel increase on rural roads was 2.8 percent, compared with 2.4 percent on city streets.

Manual vehicle classification counts conducted in 32 States indicated that 7.1 percent of all passenger-car travel was by vehicles smaller than the "standard" American passenger car. Of cars carrying out-of-State license plates, the percentage of small and compact cars was greater than for standard cars in four-fifths of the States.

In the continuing effort to improve the accuracy of estimates of traffic volumes, additional data were amassed in the study of reliability of the annual rate of change of traffic volumes on rural roads as determined by data from continuous-count traffic recorders. Traffic counting in urban areas was further extended. Special emphasis was placed on the means of obtaining comparative measures of traffic volumes along the Interstate System to determine traffic growth on the routes with respect to the corridors in which they lie. A study of traffic volumes during consecutive groups of peak hours was analyzed to ascertain the accuracy of samples obtained in time periods of less than 24 hours.

In one State new analysis procedures were used to determine the characteristics of average weights of trucks of different types. As a result of this study, substantial savings in field operations and analysis time were realized in that State and guide lines were established for use in other States. The percentage distribution of trucks by types in the flow of traffic was studied to develop improved schedules for manually classifying traffic by vehicle type.

Motor-vehicle-use studies

Statewide studies of the characteristics of motor-vehicle ownership and use have been conducted in 24 States since 1951 and analyses have been completed in 20 of these States. An analysis of 15,000 passenger-car trips in 4 States showed that the average trip length for all occupational groups was 8.5 miles, with a range from 4.8 miles for retired persons and 5.6 miles for housewives to more than 9.0 miles for most other groups. Housewives were drivers on 15 percent of the trips, representing 10 percent of the total travel, but they drove one-fourth of all the family business trips such as for medical and shopping purposes.

Nationwide data on some travel characteristics were collected during the fall of 1959 and the spring of 1961 by the Bureau of the Census for Public Roads. Information available from the fall cycle indicated that the number of trips per week varied in direct proportion to the family annual income. Families with income of less than $2,000 had only half the number of trips reported by families with income of over $10,000. Over half of all automobiles were reported as being less than 5 years old, and these accounted for almost two-thirds of all passenger-car travel.

Road inventory and mapping

Inventory operations were continued in 44 States and Puerto Rico to obtain information for use in studies of highway deficiencies, and 358 county highway maps were prepared by 31 States. Other maps were revised or redrawn under the cooperative highway planning program, including 37 State highway or traffic maps, 391 city street or traffic maps, 114 county traffic maps, and 333 urban area maps. Data were assembled for the Industry Evaluation Board on the most essential highway facilities in the Nation.

A comprehensive inventory of the Interstate System traveled way was initiated to answer inquiries about the physical characteristics and usage of the Interstate System. Yearly updating is planned.

Highway statistics

During the year the fifteenth annual edition of *Highway Statistics*, for the year 1959, was published. This volume includes comprehensive information on motor-vehicle registration, motor-fuel consumption, highway-user taxation, highway finance, mileage of highways, and related information.

Procedures were set up for obtaining State and local highway finance data for standard metropolitan statistical areas. Numerous studies and special reports made by the staff were used extensively in evaluating alternate long-range revenue proposals in connection with actions leading to the Federal-Aid Highway Act of 1961.

Traffic Operations Research

Human factors research

A study using the galvanic skin response detector was conducted during the year to determine the effects of expressway design on driver tension responses. Significant differences in relation to both design and traffic characteristics were found among four different expressway designs. The study indicated that modern highway design eliminates most traffic conflicts, but this reduction leads to greater speeds which arouse increased tension from interaction with the physical characteristics themselves.

A study of the effect of improved communications between drivers on headway between vehicles was nearly completed. At speeds of about 55 miles per hour, improved information on the type of maneuver that the driver of a lead car is about to undertake reduces distance headway of the following car by about one-third. At lower speeds, the reduction in headway is much less.

Research was undertaken to determine the psychological factors causing lateral displacement in driving. The development of an electronic device to measure the lateral displacement of a moving vehicle was completed, and collection of field data was scheduled.

A field investigation was planned to determine the influence of highway design on the routes selected by drivers, through a questionnaire devised to elicit driver attitudes toward a toll expressway and a free-access primary roadway. In addition, the galvanic skin response technique was to be used to obtain further evidence on the effects of roadway design on driver tension responses.

In a cooperative research project, the Applied Psychology Corporation was investigating the influence of mental set and distance judgment aids on following distance, and the personal characteristics of automobile drivers related to following distance. The study indicated that following distance is a stable measure of driving performance, and speed and emergency instructions affect following distance. It was also demonstrated that use of visual and timing aids in the vehicle improve driver ability to maintain acceptable headway, and

education and driving experience are positively related to accuracy of distance judgment.

Another cooperative project, at the Battelle Memorial Institute, used the theoretical approach to explore the basic problems of intervehicular communications, and was aimed at the development of an organized conceptual framework for dealing with the problem of driver-to-driver transmission of information. This should lead to the establishment of criteria for communication effectiveness and ultimately to the development of techniques for evaluating existing or proposed intervehicular communication systems.

Freeway traffic surveillance and control

A research study of means of increasing operational efficiency on urban freeways where heavy peak-hour demands or individual vehicle stoppages create extreme congestion conditions was being conducted by the Michigan State Highway Department, the Wayne County Road Commission, and the Detroit Department of Streets and Traffic, in cooperation with Public Roads. Fourteen television cameras, covering a 3-mile section of the Lodge Expressway in Detroit, were being monitored simultaneously at a central control room. In addition, automatic traffic-measuring equipment in conjunction with high-speed computers was being used to study traffic characteristics under the various conditions that occur on the freeway. As a means of controlling traffic to improve operating conditions, a complete system of lane- and ramp-use control signals and variable speed-limit signs was being installed on the study section. These will be operated by a single observer in the control center. The research project includes studies in the areas of evaluation of television surveillance for freeway observation, evaluation of the traffic control system and the automatic sensing and computing equipment, and other traffic operation research.

Another freeway surveillance project was started on the Congress Street Expressway in Chicago under the joint sponsorship of Public Roads, the Illinois Division of Highways, Cook County, and the City of Chicago. The project is intended to develop a means of detection of operating conditions on the study section. Field studies were underway to determine the location of critical points and the causes of congestion.

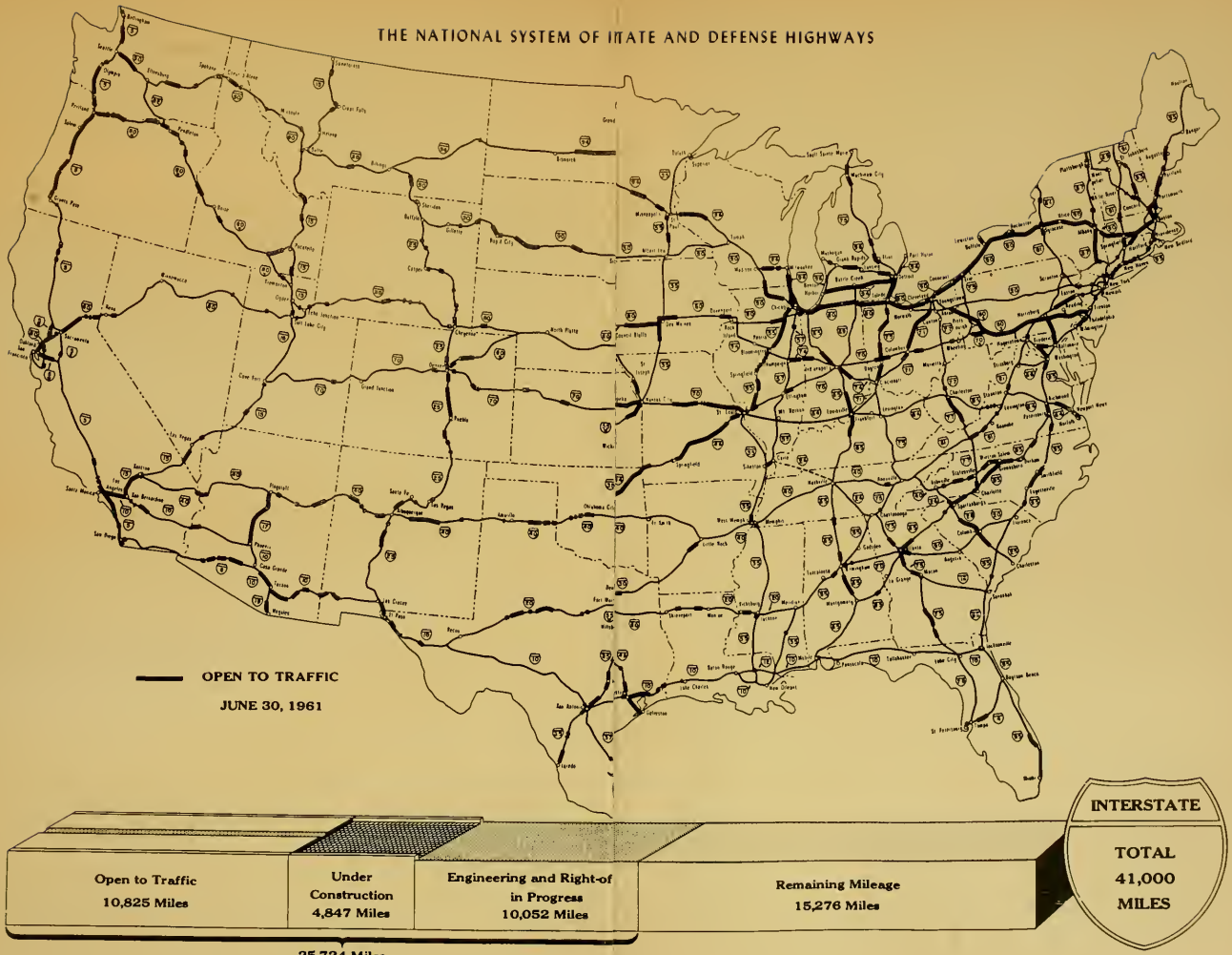
Highway capacity research

A report was completed during the year on methods of increasing the traffic-carrying capabilities of major urban arterial streets. Based upon a detailed study of traffic operations on a typical arterial in Washington, D.C., the findings are applicable to arterial streets generally. The study showed that correction of midblock frictional factors often was necessary before the full capacity of intersections, usually considered the controlling feature, could be realized. Correction of offstreet congestion in driveways and parking lots was sometimes found critically needed to smooth the arterial flow.

A computer analysis of intersection capacity data from 1,100 heavily used intersection approaches was completed for Public Roads by a consulting organization. A series of five intersection capacity prediction equations was developed, for use under different basic conditions. These gave more reliable results than a single equation for all conditions, but the report showed a need for still further refinement of the data. This work was underway manually at the close of the year.

Also completed during the year were two reports on simulation of traffic by means of an electronic computer. One project, conducted by the Midwest Research Institute for Public Roads, simulated traffic entering an expressway from on-ramps. The other, similarly conducted by the National Bureau of

THE NATIONAL SYSTEM OF INTERSTATE AND DEFENSE HIGHWAYS



Standards, simulated the highly efficient urban arterial traffic flow on progressively signalized 13th Street, NW., Washington, D.C. Cooperative research directed toward unification of currently developed simulation techniques was underway at the Massachusetts Institute of Technology.

Analysis of data already submitted in conjunction with a nationwide freeway ramp capacity study was underway, while additional data continued to be gathered in field studies throughout the country. A final total of at least 200 studies appeared certain.

A cooperative exploratory study of the effect of small cars on the capacity of a highway, primarily in terms of spacing, was underway at Michigan State University.

Motor-vehicle accident studies

Thirty-six States had initiated or agreed to participate in the Interstate System accident study which will compare accident rates for completed sections of the Interstate System with nearby existing highways. In addition, 21 States were undertaking a more detailed Interstate System accident study to relate accident experience to various geometric design elements. During the year 13 States submitted comparative data for approximately 500 miles of both Interstate and existing highways, and 2 States submitted data for relating accident experience to geometric design.

Studies of the economic cost of truck accidents were completed in New Mexico and Utah during the fiscal year, the passenger-car phase of these studies having been completed previously. A similar study was underway in Illinois, and Ohio was planning one. These studies, conducted with Public Roads cooperation, are Statewide in scope and encompass the driving experience of passenger-car and truck owners during one year. The data relate accidents and their costs to highway systems, design features, traffic volumes, road conditions, age and sex of drivers, type and age of vehicles, etc. The results help pinpoint the major factors contributing to the sizable economic losses resulting from motor-vehicle accidents.

Dynamic characteristics of vehicle loads

Research was continued on two cooperative research projects undertaken by Public Roads to develop a dynamic theory in road-loading mechanics which will permit the prediction of road life from the characteristics of traffic flow, and which will indicate the effect on road life of changes in vehicle suspensions and other elements of the system. A computer program relating the dynamic and static performance factors of both vehicle and road is envisioned. The frequency responses of passenger cars to known inputs and the resulting wheel loads imposed on the road were investigated for Public Roads by the Purdue Research Foundation, while the Cornell Aeronautical Laboratory used a theoretical approach to investigate the effect of longitudinal moving loads on the dynamic behavior of the road.

Brake research

In a comprehensive study of emergency braking systems for combinations of commercial motor vehicles, undertaken by Public Roads for the Interstate Commerce Commission, the final series of laboratory tests was completed. Most of the road and laboratory test data were analyzed. The study, aimed at resolving controversies concerning the safeguards in motor-vehicle braking systems necessary to prevent "runaway" accidents, had industry participation and advice and assistance of an advisory committee to the Interstate Commerce Commission.

Manual on Uniform Traffic Control Devices

The comprehensive revision of the *Manual on Uniform Traffic Control Devices*, long in preparation, was completed during the year and was being printed by the Government Printing Office. Prepared by a joint committee representing national organizations interested in traffic safety, with Public Roads staff assistance, the manual has been approved by the American Association of State Highway Officials and adopted as the official standard for Federal-aid highways. In addition to a general updating of previous standards, the new manual includes specifications for the signing of expressways, control of traffic at construction and maintenance sites, and emergency civil defense signing.

Instrumentation development

The construction of specialized data collection and recording systems used in the many phases of traffic operations research has been accelerated. During the year a traffic impedance analyzer was developed. This instrumentation, installed in a passenger vehicle, is capable of automatic digital recording of travel speed, distance, time, and fuel consumption, as well as manually coded data. A second unit of the expressway traffic study instrumentation, using high-speed paper tape punches for recording, was under construction. A general-purpose data recording trailer with telemetry input for use in instrumented moving-vehicle studies was being designed.

Motor-vehicle economics studies

The study to determine the optimum economic size and weight limitations for commercial motor vehicles and to estimate the changes in highway freight movement that may be caused by adoption of these limitations was nearing completion. One phase of this study, completed during the year, related changes in vehicular operating costs to changes in gross weights of tractor-trailer combinations. Study continued on a comparison of gross vehicle and axle weights with the cost of constructing and maintaining highways.

Research was continued to establish the differential road-user benefits resulting from improvement of the various rural and urban highway systems. A computer program was developed for the differential road-user benefit analysis, in connection with the highway cost allocation study. Field tests were begun to determine the effects of number of traffic lanes and traffic volume on the fuel and time consumption of passenger cars.

Highway Needs and Economy Research

Construction and maintenance production studies

An extensive study of highway maintenance operations in Iowa, undertaken in cooperation with the Iowa State Highway Commission, reached completion of the field phase during the fall of 1960, and a report of the findings, conclusions, and recommendations was being prepared. The findings hold promise of providing valuable assistance, not only to Iowa but to all highway maintenance organizations, in achieving more effective and efficient handling of the constantly growing workload of maintaining the Nation's highways.

Interim reports were prepared by Ohio State University covering further studies of improved drying of aggregates for bituminous highway pavement mixes. These studies were being continued through cooperative research contracts with the University, and through field observations on a number of production dryers encountered on highway paving operations.

Other equipment performance and productivity studies on construction work were completed on seven projects.

Highway management studies

A report on the census of highway engineering employment in State highway departments was completed. Work continued on the similar census for counties and cities.

The pilot study in the Wisconsin State Highway Commission to investigate the cause and effect of factors, internal and external, on the production of engineering plans for construction projects, was virtually completed.

The management portion of the study of maintenance operations on State highways in Iowa was completed. Recommendations were made concerning organization, policies, and management actions involved in carrying out maintenance operations.

Intensive study was begun to develop improved procedures of short-range and long-range programing of construction projects.

Highway cost studies

Preliminary construction costs were determined for highway facilities of different levels of structural capacities for various gross weights of commercial motor vehicles.

Assistance was provided to the National Association of County Engineers in their research program on methods of county road management. Important contributions were made to their manual on road experience records (cost accounting for county management) which was published during the year.

Pilot studies were nearing completion on the effects that various traffic volumes have on the length of service lives of highways. A service life study was also underway, using information reported by the State highway departments, to show the effects of the stepped-up highway program on the service lives of highways.

Research in highway economics and finance

Research undertaken for the highway cost allocation study was completed during the year. Further research was in progress on the allocation of highway costs between highway users and others according to the relative-use and earnings-credit procedures, and among vehicles of various types and weights according to the ton-mile theory. This was oriented toward solving the problems of highway cost allocation on all highway systems and at all levels of highway administration, with the aim of assisting the States and local governments in formulating long-range programs for meeting their highway finance responsibilities.

A study was being made of the underlying demographic and economic factors that generate the demand for highways and highway services and that provide a basis for estimating how much money will be needed to finance future highway activities. How much income present and contemplated sources of highway funds can be expected to produce at present rates of taxation was also under study. A corollary research was devoted to the theories and methods that have been and are being used in forecasting levels of these demographic and economic factors. The aim of this research is to develop modified or new forecasting techniques that can be applied in these areas to produce predictions more accurate than have been possible in the past.

Other research included investigation of the highway implications of the rural-to-urban population shifts confirmed by the 1960 Census; the fuel-consumption characteristics of privately owned automobiles, with specific attention to the consumption rates of the American compacts and imported small vehicles; and the value characteristics of motortruck transportation.

Economic impact studies

The comprehensive research program on the economic impact of highways was continued throughout the year. These studies, intended for use in connection with route planning, highway hearings, highway design, land acquisition, public relations, etc., were being conducted by State highway departments and universities in cooperation with Public Roads. The studies completed and those in progress concern themselves with a wide range of aspects pertaining to highway improvements, such as the effects of highways on land value and land use, land-use control at interchange points, and the relationship of highway improvements to public services, tax bases, central business districts, and public utilities.

During the fiscal year 30 economic impact studies were completed, bringing the total to 95 studies completed in 28 States, plus 16 studies nationwide in character. Studies in progress totaled 40 in 30 States, plus 1 nationwide research project. Some of the studies completed during the year bore on specific features; for example, two Kentucky studies provided an interesting contrast between the effects of two highways, one with controlled access and one without such control. Studies nationwide in scope evaluated highway improvements with relation to special assessments, public services, tax bases, and central business districts.

Right-of-way research

In cooperation with Public Roads, an increasing number of States had embarked on studies dealing with severance damages and partial takings incurred in the acquisition of right-of-way for highways. By the end of the year over 40 States were engaged in, or were about to commence, such studies. A number of publications (approximately 100, many of them single case-history reports) presenting results of these severance damage studies had been issued by various agencies.

A guide manual was completed for making studies of severance damages, the principal aim of which is to systematize the methods of gathering and recording severance damage information so that these data may be utilized more effectively. Included in the manual was a severance damage reporting form devised for use with either mechanical data processing or manual compilation techniques. The manual will be used by States making this type of study, and the cases collected are expected to make up a "bank" from which individual States can draw information on comparable cases.

In cooperation with the American Association of State Highway Officials, the first draft of a manual for training right-of-way personnel was prepared and distributed to the States. Also in cooperation with AASHO, a comprehensive study of State practices in the right-of-way acquisition field was commenced. A first report, on the subject of State practices pertaining to the disposition of improvements located on land acquired for highway rights-of-way, was prepared during the year.

In connection with the study of liaison between utilities and highway departments, also undertaken cooperatively with AASHO, a questionnaire on the subject was developed and sent to all State highway departments and to utilities and other agencies concerned.

All court decisions pertaining to condemnation of land for public purposes handed down during the year were reviewed and analyzed in a report prepared in cooperation with the American Bar Association.

Highway interchange studies

During the year, the first draft of the interchange study being conducted for Public Roads at the University of Washington was completed. This study concerns itself with such considerations as the supply and demand for land at highway interchanges, models of land-use developments and related traffic flows, measurement of industrial land consumption by major industry classifications, and an evaluation of land-use controls at freeway approaches. Other studies dealing with land development and land-use control at highway interchanges and approach areas were underway in several of the States, including Oklahoma, Pennsylvania, and Texas. In many of the economic impact research studies attention is directed to the interchange aspect of highway improvement.

Highway laws research

As part of a thorough analysis of all areas of highway law, in which Public Roads, the American Association of State Highway Officials, and the Highway Research Board are cooperating, reports were prepared during the year on the law of all the States pertaining to traffic engineering, highway programing, and toll facilities. Legal research was completed in connection with laws on highway administration and highway planning.

The relationship between the police power and highways was further studied and reports were prepared on the benefits to the highway system which can be obtained by subdivision regulation, by zoning, and by combination of all forms of planning regulations in the vicinity of interchanges.

A study was made of all State legislation which provides for the reservation of land for future highway use by means of mapped street powers.

Several States interested in conducting highway laws revision projects were advised on study methods and procedures. Assistance was furnished to a number of States and municipalities on legal, financial, and administrative matters in connection with parking studies.

Hydraulic Research

A study of peak rates of stormwater flow from small watersheds, applicable to most of the area of the United States east of Colorado, was published during the year.

Research on stormwater flow from urban areas was continued at the Johns Hopkins University, under joint sponsorship of Public Roads, the City of Baltimore, and Baltimore County. Data obtained from Delaware and England were included in analytical studies.

A basic study on the hydrodynamics of curb-opening inlets for storm drains was completed at Stanford University. Additional experimental research on curb-opening inlets was conducted by Colorado State University. A study of unsteady flow in storm drains was begun at Colorado State University, aimed at development of a digital computer program for routing stormwater hydrographs through storm drains. All of these projects were sponsored by Public Roads.

An experimental investigation of the flow capacity of corrugated structural plate metal pipe with 2-inch corrugations was nearly completed at the Waterways Experiment Station, Vicksburg, as a joint project of the Corps of Engineers and Public Roads.

The National Bureau of Standards completed an intensive investigation of the hydraulics of pipe culverts for Public Roads during the year. The research

shows that substantial improvement in the flow capacity of pipe culverts can be obtained by relatively simple changes in entrances. Research was continued on improvement of box culvert flow characteristics.

Colorado State University completed a study for Public Roads on control of scour at cantilevered pipe culvert outlets by use of gravel armor plating in natural stilling basins. The University also completed a report on laboratory studies of scour around bridge abutments and conducted an analytical study of the mechanics of local scour.

A report on the hydraulics of bridge waterways for use by field engineers was published. Another report including numerous charts to facilitate computation of flow in open channels was being prepared for publication.

Physical Research

Soils and foundations

Evaluation of apparatus and methods of measuring the physical characteristics and condition of soil materials more rapidly was continued during the year. A report was prepared on a device using the reaction of calcium carbide with moisture for rapid measurement of moisture content of soil materials on construction projects. Initial work with a single-channel seismic device indicated that it is useful in shallow explorations, but has some limitations in deeper explorations and for some geologic conditions. Further use was made of electrical resistivity apparatus to prove its value in landslide studies. Nuclear apparatus that uses radioactive materials, detectors, and counting devices to measure the moisture content and density of soil materials was evaluated in the laboratory and field by Public Roads and five States; Colorado prepared an interim report on its evaluation. Kentucky initiated a study of nuclear gages.

A report on laboratory evaluation of phosphoric acid for the stabilization of fine-grained plastic soils was prepared. Georgia constructed two experimental road sections with soil base courses stabilized with phosphoric acid; adjacent control sections were built with base courses stabilized with portland cement. Illinois reported on a laboratory study and field experiments using soil-lime mixtures in base courses. Other cooperative studies of soil-lime mixtures are being conducted in Louisiana, Minnesota, and West Virginia.

Basic research studies were continued on soil-clay minerals as related to soil stabilization and other engineering uses of soils. Two phases of the work dealing with clay-organic complexes were completed, and a study of volume change of soils was continued.

Studies of the characteristics of soft foundation soils were also continued. A report was prepared on long-time laboratory consolidation tests of peats, mucks, and chemically similar materials. A study of soft soils by means of vane shear tests directly in sampling tubes was started. Foundation soil samples from the site of the proposed Cooper River bridge in South Carolina were tested to develop design data.

The cooperative program with the Soil Conservation Service, U.S. Department of Agriculture, for the preparation of engineering information for county soil survey reports was continued. Thirty State highway departments are cooperating by testing soil samples and preparing other engineering information regarding soils. Public Roads tested soil samples, correlated test data from State laboratories, and reviewed the engineering sections of 28 county soil survey reports.

Cooperative surveys of aggregates were continued in 10 States and initiated in Puerto Rico. Cooperative studies with five States for the development of soil maps and reports for highway engineering purposes were continued.

Bituminous materials and pavements

Public Roads research on bituminous pavements during the year included studies of mixture design procedures, construction practices, properties of materials, development of new methods of tests, and the correlation of properties of bituminous mixtures and pavements with field performance.

Studies aimed at improving flexible pavement design methods were continued. A report on a cooperative study in Georgia of the mechanics of load support of flexible pavements was prepared, and a correlation of results by two laboratory procedures for developing strength data for flexible pavement design was started in Louisiana. The correlation of flexible pavement design and performance with load and deflections was continued in four States and inaugurated in Minnesota. Comprehensive field studies of selected representative flexible pavements in Oklahoma, South Dakota, and Arkansas, to obtain data that will lead to improved design procedures, were continued, and a report on one phase of the Oklahoma study was prepared.

Research to develop new design procedures and methods of testing bituminous paving mixtures was receiving more widespread attention. Studies were underway using the gyratory compactor in an effort to develop a better design procedure to predict more nearly the performance of bituminous pavements. Cooperative studies using this apparatus were planned by Louisiana and West Virginia. Studies of fatigue and of resistance to cracking of bituminous pavements were continued by Public Roads and cooperative studies were in progress in Ohio, Oregon, and Texas. The construction of apparatus to measure air permeability of bituminous pavements, using the California Research Corporation design, was essentially completed and will be used to develop information on permeability as a means of control of compaction.

Research related to the control of construction of bituminous pavements, including heating and drying of aggregate, time and temperature of plant mixing, and the amount and method of compacting mixtures, were under study by Public Roads and in cooperation with Louisiana, New York, North Carolina, Ohio, and Virginia. These studies seek to develop information that can be used to write better specifications, containing only those controls necessary for the purpose, which will result in pavements having the designed properties.

Studies were being conducted in many States on the correlation of bituminous pavement properties and performance with design properties. Public Roads continued cooperative studies with Delaware, Maryland, and Virginia in observing and testing experimental roads. A report covering 12 years' history of the Maryland experiments was prepared. Similar cooperative correlation studies were underway or planned in Illinois, Louisiana, Maine, New York, Oregon, and Texas. An informal cooperative study with Nebraska sought to correlate mixture density and stability with resistance to pavement rutting.

Among the materials not heretofore commonly used in bituminous pavements are asbestos fibers and hydrated lime. A number of States were conducting research on these materials and using them in experimental pavements. Public Roads was studying the effect of asbestos on the properties of asphaltic paving mixtures and pavements constructed in Delaware and the effect of hydrated lime on mixtures and pavements in Texas.

A cooperative study of the use of wire reinforcement in bituminous mixtures for concrete overlays was planned by New York and locations of the experimental pavements were selected.

Consultation and technical assistance in evaluating materials to be used in bituminous construction and of the performance of pavements in service was given to Public Roads field offices and to a number of States.

During the year emphasis was placed on studies of the fundamental properties of bituminous materials. These included the development of methods for determining absolute viscosity and its relation to the properties of bituminous pavements. Cooperative studies with several States were underway or planned. Some of these were of a fundamental nature, while others were designed to determine generally the effect of asphalt viscosity on the mixing, spreading, and compaction of the paving mixtures. Studies to correlate properties of bituminous materials with field behavior of pavements were being conducted simultaneously.

A report was prepared on a comparison of changes in asphalt viscosities that occur during two widely used accelerated hardening tests. Another report covered an informal study on the precision of the Zeitfuchs tube for measuring the kinematic viscosity of cutback asphalts.

A study of the properties of liquid asphaltic road materials by means of vacuum distillation, and examination of both the distillate and residue, was progressing. This study should provide basic data for improving the testing procedure for such materials, which would ultimately lead to better specifications and hence higher quality and more uniform products.

Studies of new or specialty products have continued. A report was planned on the work done on coal-modified tar binder. Studies of the newly developed binders which provide colored bituminous pavements (yellow, red, etc.) were begun. New York was conducting a cooperative study of cationic emulsions, a relatively new material in the United States.

Several cooperative studies with technical committees of the American Society for Testing Materials were conducted for the development of standard test methods.

Chemical investigations

A field and laboratory study on abrasion-resistant paints for steel bridges was continued in order to find better paints for Alaska. Preliminary results indicated that rubber-based paints offer greater abrasion resistance. Outdoor exposure studies of new rust-inhibitive paints for structural steel were continued. Early trends indicated that lead-silico-chromate and zinc-rich inorganic paints show promise in corrosion resistance. A cooperative study to use radioisotopes in the development of test methods and formulation of traffic paints was started in Georgia. A cooperative study with Washington was in progress to evaluate the performance of permanent-type traffic markers.

A report was published on the application of infrared spectroscopy to the identification of water-reducing retarders for concrete. The method is useful as a rapid means for detecting possible adulteration or mislabeling of these materials and to ensure the uniformity of products used on the same project.

In cooperation with the National Bureau of Standards and other government and industrial laboratories, precise analyses of five cements were undertaken for the purpose of establishing new portland cement standard samples. These will be used for standard reference in instrumental and general methods for analyses of cement.

In cooperation with the American Society for Testing Materials and State highway departments, limited investigations were concluded on the application of infrared spectroscopy to the determination of uniformity of shipments of traffic paint; on improvements in the chemical method for determining the original cement content of hardened concrete; and on the spectral identification of concrete retarders used in State research.

A cooperative study with Montana was initiated to study the electro-chemical surface properties of bituminous aggregates in order to provide for a better selection of aggregates, additives, and asphalt for bituminous construction.

Cement, aggregates, and concrete pavement

Two reports were published during the year on research investigations of the chemical properties and identification tests of retarders and their effect on strength and other properties of portland cement concrete. It was found that retarders as admixtures for concrete increased compressive strength, reduced water requirement, and did not adversely affect durability or volume change. Retarders are of value in concrete placed under conditions of high temperature and low humidity, or when the concrete is hauled long distances. A guide specification for retarders was also published.

A report was completed on an investigation of the use of portland blast-furnace slag cement in place of normal portland cement in concrete. Concrete prepared with the slag cement gave lower strengths at early ages and higher strengths at later ages than concrete prepared with normal portland cement. The slag cement did not adversely affect the durability, volume change characteristics, or the resistance of the concrete to scaling caused by the use of salts for ice removal.

A report was prepared on additional tests of the use of fly ash as a replacement for part of the portland cement in concrete. These tests showed that concrete containing high-carbon fly ash had lower strength and durability than concrete containing low-carbon fly ash. It was found that fly ash could be used as a replacement for portland blast-furnace slag cement without serious decrease in strength or durability.

A report was prepared on tests of the durability of concrete slabs exposed to outdoor weathering and to scaling caused by the use of salts for ice removal. The use of air entrainment in increasing the resistance to scaling was demonstrated. However, as some scaling was obtained on air-entrained concrete, the use of other materials with air-entrained concrete was tried. Materials applied to the surface of the hardened concrete were found of little benefit in preventing scaling. A number of admixtures, including several silicones, were tried and most of them were found to be beneficial. Investigation of the effect of silicone admixtures on the properties of concrete was being continued.

Work on the development of test methods for concrete was continued. A report was being prepared on the indirect tensile (cylinder splitting) test, recently adopted as a tentative standard test by the ASTM, which may eventually replace the flexural strength test. Work was also being done on the development of a simple test to measure the wear resistance of concrete.

A study of the use of lightweight aggregates was continued, to determine the effect of the use of these materials on the properties of concrete. The effects of the type of raw material, manufacturing process, and degree of saturation by water when used were being studied. Tests were being made to determine the relation between the physical properties of the aggregates and the properties of concrete prepared with them. Particular attention was being given to the development of a structural strength test of the aggregate particles that will correlate with the strength of concrete.

Control of the quality of concrete is facilitated if the cement content of the concrete can be determined. A method for making this determination on the plastic concrete by means of a centrifuge was being studied.

Cooperative investigations of continuously reinforced portland cement concrete pavements in Mississippi and South Dakota were added during the year to those in progress in five other States. Pioneered in 1938 by Public Roads and Indiana, 10 States have built one or more of these so-called jointless pavements. Of the 110 equivalent 2-lane miles now in service, nearly one-third were constructed during the past year. End anchorages as a possible solution to the problems associated with large end movements featured recent construction.

Statewide performance surveys of concrete pavements in Illinois, Maryland, Michigan, and Oklahoma were continued. These may lead to refinements in design criteria. Other cooperative projects included investigations in New York on the configuration of the joint groove for optimum sealing, and on the corrosion of dowels using unprotected steel, stainless steel sleeves, and nickel coatings; in Indiana on the effectiveness of soil-cement, dense-graded and open-graded subbases of various thicknesses in the control of pumping; and in California on the cause and prevention of erratic cracking.

Still other cooperative projects included studies at the Cornell Aeronautical Laboratory on the development of a mathematical model of the behavior of pavements under dynamic loadings; at Purdue University on the development of a nondestructive method of measuring moisture gradients in hardened concrete; at Lehigh University and the University of Maryland on the lap requirements for longitudinal reinforcing steel in continuously reinforced pavements.

Road surface research

Alabama and Nebraska joined 21 other States and agencies which have roughometers constructed from Public Roads plans. The nationwide correlation study of this type of equipment was continued, with 15 machines receiving this service to date. Cooperative studies were continued on the riding quality of pavements in Illinois, Maryland, Michigan, and North Dakota.

Rigorous tests conducted on the Public Roads single-wheeled skid-resistance trailer indicated the need for redesigning the equipment. A new two-wheel trailer, under construction, will permit determination of friction coefficients with either one or both wheels locked. A British portable skid-resistance tester was acquired.

Bridge and guardrail research

Reports on dynamic tests on bridges in Missouri, Nebraska, and South Dakota were in preparation. Plans were developed for using the Public Roads equipment and personnel in the dynamic testing of bridges in Maryland and Virginia in the summer of 1961. Public Roads personnel participated in tests of the bridges on the AASHO Test Road, using the Public Roads electronic field testing equipment. Analysis of the test data by a University of Illinois team was based upon the findings of the cooperative theoretical and laboratory research on this subject at the University. The correlation has been very good.

Tests made in the Public Roads wind tunnel on a one-fiftieth scale section model of the San Pedro, Calif., suspension bridge led to design changes which improved its aerodynamic characteristics and also reduced its cost. Exhaustive studies were made on a one seventy-fifth scale section model of the Golden Gate Bridge in an investigation of various schemes for the modification of the bridge to carry rapid-transit facilities. The report on these tests was incorporated in the report of the consultants on the feasibility of the project. Preparations were being made to test a section model of a proposed suspension bridge over the Tagus River at Lisbon, Portugal.

Electronic devices for measuring and recording all components of the wind velocity at a given point were being developed cooperatively by Public Roads and the University of Washington. Part of the tests will be made in the Public Roads wind tunnel. A number of the electronic recording devices, disposed about a suspension bridge or at a proposed bridge site, would make possible a detailed and comprehensive study of wind conditions, thus permitting a more specific application of the results of wind tunnel tests on section models to the prediction of the behavior of a suspension bridge in the wind.

The cooperative research on riveted and bolted joints at Lehigh University and the University of Illinois, which led to important changes in the AASHO and other bridge specifications, continued to develop new knowledge. The plate girder studies at Lehigh University were continued. Cooperative studies of fatigue in steel at the University of Illinois were extended into the fields of concrete reinforcement, high-strength steels, and inspection practice. Important reports were prepared on the concrete and prestressed concrete research at Lehigh University and the Universities of Illinois and Missouri, and all of these studies were continued. Cooperative studies of precast concrete units were made at the University of North Carolina, where studies were also initiated on the action of diaphragms between the beams of steel bridges. Cooperative tests on a half-scale model of a 200-foot steel truss bridge at Northwestern University provided important information on the behavior of compression members under the influence of other members of the truss. A series of tests showed the possibility of predicting the load-carrying capacity of end posts which have been damaged by collision.

Cooperative studies of the use of epoxy resins for obtaining composite action of concrete slabs and steel beams and for other applications in bridge design were in progress at the University of Arizona and Rensselaer Polytechnic Institute. Under a cooperative project in California the State Division of Highways made extensive dynamic load tests on an 80-foot concrete box girder bridge to study load distribution, the effect of diaphragms, and other factors; and the University of California made a one-fourth scale model of the same structure and began tests for correlation with the field studies. Cooperative research was started at the Cornell Aeronautical Laboratory for determining the behavior of bridge railing under the impact of vehicles and the design criteria for a railing to provide adequate protection to traffic.

Studies of guardrail performed by Rhode Island in cooperation with the Owens-Corning Fiberglas Corporation were completed. The planned impact tests were made on three different types of guardrail—woven wire fabric, a standard steel beam, and a fibrous-glass reinforced plastic beam similar in cross section to the steel beam. Full-scale dynamic tests of highway barriers were initiated by New York in cooperation with the Cornell Aeronautical Laboratory. Comprehensive mathematical equations representing the structural response of the barrier will be developed and validated by realistic impact tests.

Foreign Activities

Inter-American Highway

Since 1930 the United States, through the Bureau of Public Roads, has been assisting the Republics of Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama in the construction of the Inter-American Highway, which is that section of the Pan American Highway System from Nuevo Laredo, on our Mexican border, to Panama City at the Pacific terminal of the Panama Canal, a distance of 3,142 miles. Connecting highways from El Paso and Nogales, Tex., now afford more direct routes to Mexico City from the western United States. The section of the highway in Mexico has been financed and constructed entirely by Mexico. At the end of the year 96 percent of the Inter-American Highway was passable in all kinds of weather by motor vehicles, but uninterrupted travel to Panama City was still an impossibility.

Throughout its length of 1,587 miles in Mexico, the highway was open and practically all of it was paved. South from the Guatemala-Mexico border, the highway was also passable over paved or gravel roads for 1,118 miles to San

Isidro, Costa Rica. In this distance, many sections were under construction, but the route was open and passable without undue difficulty. From San Isidro to the Panama border, a distance of 133 miles, grading and gravel surfacing was completed and 39 bridges were under construction. Upon completion of these bridges the entire route of the Inter-American Highway will be passable. From the Costa Rica border to Panama City, a distance of 304 miles, the highway was passable at all times but considerable construction was underway.

The condition of the Inter-American Highway in the Central American Republics and work accomplished during the fiscal year are described in the following paragraphs.

In Guatemala, the highway was passable at all times. Occasional slides and washouts may delay traffic in the Selegua Canyon for short periods during the next few years until the highway becomes stabilized. During the year 39 miles of base course and paving were constructed from Patzicia north to Los Encuentros. Grading on 42 miles of the route in southern Guatemala was completed. Construction proceeded slowly on the remaining bridges.

In El Salvador, the highway has been completed throughout the country.

In Honduras, base course and paving work was underway for the entire length, but progress was slow during the year.

In Nicaragua, the base course and paving was completed on the 22-mile section between Rivas and the Costa Rica border. Similar work was under construction on the last unpaved section in Nicaragua, between Condega and Sebaco, a distance of 49 miles. Good progress was made during the year.

In Costa Rica, all of the grading and drainage work previously under construction was completed, and construction was started on the 39 bridges along the only remaining impassable gap in the entire length of the Inter-American Highway. This gap extends for 133 miles from San Isidro south to the Panama border.

In Panama, the 17-mile section from the Costa Rica border to Concepcion, which was previously impassable, was opened to all-weather travel by completion of a gravel surface. Work on 87 miles of highway was substantially completed at the end of the year after 2 years of delay because of the failure of the original contractor. The concrete paving on a 28-mile section from Aquadulce to Penonome was completed.

Other Central American projects

In Guatemala, Public Roads continued furnishing technical engineering assistance to the International Cooperation Administration in connection with the construction and improvement of the Pacific Highway from the Mexican border to the border of El Salvador, and a rural development road program.

In Costa Rica, a Public Roads equipment specialist continued to assist the Government in the purchase and maintenance of construction equipment and training of operators, and an engineer supervised the construction of the San Jose-El Coco Airport project being financed with a loan from the Export-Import Bank. In addition, a bridge engineer and an administrative officer were sent to Costa Rica on short assignments.

In Panama, three equipment specialists continued to furnish technical aid and assistance to the Government in connection with the operation and maintenance of road construction equipment and the training of equipment operators.

The United States is aiding Nicaragua financially in the construction of the Rama Road which, when completed, will form the main transportation link between the settled portion of Nicaragua on the Pacific Coast and the large, undeveloped fertile areas of eastern Nicaragua and the Atlantic Ocean. The

155-mile road extends east from San Benito on the Inter-American Highway to Rama, a potential river port on the Escondido River. Construction began on this road in 1943 with United States funds and continued until June 1948. At that time, 92 miles of all-weather road had been completed eastward from San Benito. Work was resumed in 1955 and since then 58 miles of road and bridge work have been put under contract, of which 44 miles have been completed. Funds were available for only a portion of the remaining 5 miles.

Other foreign aid activities

Since the end of World War II the Bureau of Public Roads has provided technical assistance, advice, and consultation in many foreign countries in cooperation with the Department of State, the Export-Import Bank, and the International Bank for Reconstruction and Development. The objectives of such assistance have been to further the programs of highway improvement and communications in those countries, thus fostering their economic and social growth. Emphasis has been given to aiding the countries in establishing competent highway organizations and training nationals to staff them.

Public Roads actively participated in highway improvement programs in 22 countries during the fiscal year 1961. Programs in 20 of these countries—Cambodia, Cameroun Republic, Chile, Colombia, Jordan, Laos, Lebanon, Liberia, Mali, Morocco, Nepal, Peru, the Philippines, Somaliland, Southern Cameroun, Spain, Sudan, Togo, Turkey, and Yemen—were sponsored by the International Cooperation Administration (ICA). The program in Ethiopia was financed by a loan from the International Bank for Reconstruction and Development (World Bank), and the program in Iran was financed by a loan from the Export-Import Bank. In both of these countries, technical assistance was provided under a direct agreement with the Bureau of Public Roads.

In 11 of these countries programs of assistance begun in previous years were continued, while new programs were initiated in Cambodia, Chile, Colombia, Peru, and Spain. In Cameroun, Chile, Mali, Morocco, Somaliland, Southern Cameroun, and Togo, the assistance requested was completed within the fiscal year, and major activities in Turkey and the Philippines were phased out.

Activities in Cambodia.—Late in the fiscal year ICA requested Public Roads to provide engineering supervision and assistance in accomplishing repairs and reconstruction on the Khmer-American Friendship Highway in Cambodia, from Phnom Penh to the port at Sihanoukville. Two engineers were promptly sent to Cambodia to study the materials and construction problems. It is expected that this will become a major project within the next fiscal year.

Activities in Chile.—At the request of ICA and the Government of Chile, two Public Roads engineers went to Chile during the fiscal year for periods of 3 months each. The Government of Chile had purchased modern bituminous paving equipment and had underway an ambitious program of bituminous paving, but training of engineers, technicians, and equipment operators had not kept pace with the importation of equipment. The Public Roads engineers instructed personnel and assisted in improving existing practices on bituminous paving work, with gratifying results.

Activities in Colombia.—A Public Roads engineer was sent to Colombia, at the request of ICA and the Government of Colombia, for 3 months early in 1961. During that period he assisted the Ministry of Public Works in completing applications for loans for road construction from the Export-Import Bank and the Development Loan Fund. He returned to Colombia in April 1961 to begin a 2-year stay as technical advisor to the Ministry of Public Works.

Activities in Ethiopia.—Public Roads has continued to assist the Imperial Highway Authority of Ethiopia in all phases of its expanding highway activity since 1951. Public Roads personnel have functioned in key positions of the Imperial Highway Authority and have provided training at the professional, subprofessional, and artisan levels. The Imperial Highway Authority is now largely staffed by Ethiopians who have been trained under this program, including five of the six district engineers. A substantial mileage of highways has been constructed or reconstructed and was being well maintained, and the benefits to Ethiopia have been outstanding.

All phases of the program in Ethiopia were continued throughout fiscal year 1961. Maintenance operations were extended to include asphalt resurfacing of an additional 100 miles of road. Work was continued on force-account betterments and contract work was begun on 8 bridges varying from 50 to 150 feet in length. Fourteen Public Roads employees were assigned to Ethiopia at the end of the fiscal year.

Activities in Iran.—During the fiscal year Public Roads technical assistance in Iran continued to be concentrated on maintenance work, but assistance in all other phases of the highway program was expanded. Training schools for equipment operators were doing effective work. Thirty-eight prefabricated maintenance shops were being erected throughout the country. Machine maintenance had been somewhat expanded and covered 4,300 of the 17,000 miles of main roads in Iran. A bituminous surface-treatment program was started, with 250 miles of such work scheduled for the next fiscal year. A nationwide radio communications network consisting of 10 base stations and a number of units installed in motor vehicles was established. A materials testing laboratory was installed. Forty traffic counters were in operation and more were being added.

Assistance was given in modernization of the National Highway Department. A new plan of organization was established, closely approximating that of a state highway department in the United States. Basic work was completed on a tourist map of the country, to be printed on one side in Farsi, the language of Iran, and on the opposite side in English. At the end of the year it was expected that negotiations for a third Export-Import Bank loan in the amount of $3.5 million would be completed shortly, to provide additional equipment and repair parts. Public Roads personnel in Iran at the end of the year totaled 43.

Activities in Jordan.—Public Roads has given technical assistance to the Government of Jordan since the beginning of the road program in 1952. During the year the 13-man Public Roads staff carried on advisory and training activities in all areas of highway work. Agreements were signed during the year for full or partial construction of 73 miles of roads to various stages, and for construction of a district maintenance yard with shops and buildings. Work on the Sweileh-Jarash Highway was finished and the Zerka River Bridge was opened to traffic. New highway construction was being financed with United States P.L. 480 (surplus grain) funds amounting to $4.5 million. The Wadi Es Sir equipment repair and maintenance yard was completed at a total cost of $1 million, as was a new materials laboratory building.

A traffic count program and a bridge inventory were begun, and discussions were held on truck-weight regulation, highway-user taxation, and highway route and section numbering. A detailed proposal for the reorganization of the highway division of the Ministry of Public Works was prepared. Daily on-the-job training was carried on continuously between each United States technician and his counterpart. Formalized on-the-job training schools were conducted, and during the year some 50 mechanics received training. In addition, short-term

training schools were held for equipment operators and surveyors. Sixteen Jordanians were sent to other countries for training.

Activities in Laos.—Public Roads assistance to Laos began in fiscal year 1960. Two engineers were in Laos as the year opened, and further restaffing was in progress; but the coup d'etat on August 9 and subsequent events in Laos eventually necessitated evacuation of all personnel to Bangkok, Thailand. By the end of the fiscal year six of the staff had returned to Laos.

A reduced program was prepared to continue work in small, secure areas where the principal towns and the offices of the Public Works Department were located. Subsequently a new program for fiscal year 1961 was prepared, incorporating provisions for joint control of equipment, materials, and operations, with strict supervision of construction and spare parts use. Bids were advertised for construction of the 62-mile Nam Cadinh-Nam Hinboun road but subsequently, because of unsettled conditions, the project was indefinitely deferred.

Good progress was made during the year in developing the equipment repair facilities near Vientiane. A new warehouse was completed and equipped, and was receiving adequate quantities of repair parts. A new shop building was almost completed, and shop training and equipment repair was started.

A start was also made on soils studies at the Vientiane soils laboratory. A general review was made of the bridge survey of the Vientiane-Luang Prabang route and studies were made of the Bailey components needed for the structures. An understanding was reached regarding the structures that would be furnished by the British. Some 3,600 tons of bridge components from Japan arrived in Bangkok, and the preliminary design of the substructures for several of the larger bridges was completed. At the close of the fiscal year arrangements were being made to move both the Japanese and British bridge components to storage in Thailand.

During the year several miles of road construction was accomplished, including five bridges built by contract on the Vientiane-Luang Prabang route, and reconstruction, including surfacing, was completed on 38 miles of roads.

Activities in Lebanon.—Public Roads has assisted Lebanon since 1958 in its highway program. During the fiscal year the Lebanese Highway Department was assisted in the implementation of a decree for complete reorganization. Progress was made in the design of controlled-access type highways, research in bridge design using local materials, control of construction materials and laboratory procedure, and repair and maintenance of highway construction equipment. Construction work was limited due to the lack of adequate plans or frozen construction funds.

A central highway equipment repair shop was completed, and training was begun for mechanics and operators in the use of the machine tools purchased with United States aid funds. During the year $376,000 of modern highway equipment, machine tools and spare parts, and laboratory equipment was delivered and put into use. Work continued on the administration and inspection of the nationwide highway program in which the labor component was being financed with United States P.L. 480 (surplus grain) funds.

During the fiscal year $656,000 of the original grant of $1,967,000 was spent. Through these projects considerable technical know-how has been given and put into use in the construction and maintenance of rural roads. At the end of the year the Public Roads mission had a staff of six.

Activities in Liberia.—Assistance to Liberia by Public Roads began in 1952. During the fiscal year 88 miles of hard-surfaced roads were constructed including 12 miles of asphalt; 36 miles of selected-material surfaced roads were completed in the Eastern Province; and a 600-foot concrete bridge over the Farm-

ington River was completed. Construction was begun on four river bridges ranging from 280 to 760 feet in length. The Liberian Division of Highways survey parties located 60 miles of line through heavy growth, and designs were completed for 81 miles of highway. The materials laboratory, previously established with Public Roads assistance, aided the highway and public buildings programs.

Six Liberians were receiving training in United States colleges. On-the-job training of Liberian highway personnel was increased, with special emphasis on maintenance work. A rural area development program was being initiated by the Government of Liberia, and Public Roads personnel advised on equipment needs for the program and will provide technical assistance for the road construction. Eleven Public Roads personnel were in Liberia at the end of the fiscal year.

Activities in Nepal.—Public Roads has been furnishing technical assistance to the Government of Nepal in highway improvement since 1958 under a joint agreement among the Governments of Nepal, India, and the United States. The program involved improvement of existing roads and construction of others totaling over 800 miles, and training of a Nepalese staff in modern highway procedures. Throughout the fiscal year efforts of the seven-man Public Roads staff were concentrated largely on scattered construction work on low standard projects, designed and located to improve existing rural routes and to open up new areas.

Activities in Peru.—Public Roads sent two highway engineers to Peru during the fiscal year to assist the Government of Peru in implementing a highway construction program known as the "penetration road development." The program is to be financed by loans from the Export-Import Bank and Development Loan Fund.

Activities in the Philippines.—Public Roads has maintained a work group in the Philippine Islands since 1946, but its objectives have largely been accomplished and at the end of the fiscal year the mission under ICA was terminated. However, during the year Public Roads agreed to provide three advisors to the Philippine Government to assist in implementing a new highway program financed in part by a loan from the Development Loan Fund.

Activities in Spain.—At the request of ICA and the Government of Spain, two Public Roads engineers were detailed to Spain as advisors during the fiscal year and were actively assisting in training and operations. Under a new highway law, the Direccion General de Carreteras (Department of Highways in Spain) was requested to prepare a plan for road improvement for the next 16 years, divided into 4-year periods, and covering the 50,000 miles of roads under its jurisdiction. Field manuals were prepared for a road and bridge inventory, personnel were trained, and work was started with eight field parties. Equipment for the survey was developed in Madrid. Time did not permit exhaustive study of urban transportation problems but a start was being made. Field work was completed, as a pilot study, for an origin and destination study in Jerez, a city of 108,000.

A detailed inspection has been made of maintenance practices on the more important routes and recommendations were made for a maintenance organization and for procurement of maintenance equipment.

Activities in Sudan.—Public Roads has assisted Sudan in highway work since 1957. During the fiscal year, a 12-mile maintenance and betterment demonstration road was completed. Surveys were completed and plans prepared for a second 24-mile project. Construction plans for 114 miles on a road from Khartoum to Wad Medani were also substantially completed. The 13-

mile highway construction demonstration project contract was extended to 18 miles and at the end of the fiscal year the construction was about half complete.

A training aids building was erected and construction plans for a shop building were underway. A materials laboratory was equipped with American testing equipment, and additional road and shop equipment was also procured. Training of Sudanese engineers and technicians to staff a Sudanese highway organization was stepped up. Thirteen Sudanese were programed for scholarships in the United States and elsewhere, and three Sudanese returned from United States scholarships to occupy key positions in the growing Sudanese highway organization. On-the-job training was carried out in connection with all activities. The Public Roads staff had 10 members at the end of the year.

Activities in Turkey.—Assistance by Public Roads to Turkey in the highway field began in 1947. As a result of the assistance and training provided by Public Roads, the proficiency of the Turkish Highway Department had reached a level which warranted ending the broad technical assistance program in 1959.

Since that time, limited assistance has been carried on in several fields. A specialist assisted for 3 months in the completion of a traffic survey initiated in 1958. For another project, to establish an integrated accounting system and a cost research engineering department, a specialist was assigned to assist in the installation of an electronic computer and in the development of a program for its use.

Tentative plans were being made for procurement of machinery and equipment to construct adequate forest roads that would facilitate the development of the vast natural forest resources of Turkey, under an agreement between Public Roads and the Turkish Forestry Service, with financing by an Export-Import Bank loan.

Activities in Yemen.—At the request of ICA two Public Roads engineers made a reconnaissance of Yemen roads and road requirements in 1959. Subsequently Public Roads undertook the improvement and reconstruction of an existing substandard road between Mocha, Taiz, and Sana. Improvement of this road to adequate standards will be a major step in the economic development of Yemen, where transportation costs are extremely high. The program in Yemen was unusual in that the primary objective was production of road mileage, although training and organization were also of major importance.

Road building equipment and engineers were sent to Yemen during the fiscal year. Work was begun on a headquarters site at Taiz, to include residences, a major shop, warehouse, and all support facilities. The equipment was later moved to the road project and grading was started. At the end of the fiscal year heavy construction equipment had arrived and highway construction was well underway with approximately 3 miles of grading finished. The engineers had laid a tentative line between Mocha and Taiz.

A training program was started late in the fiscal year, and 10 Yemeni nationals were selected for training in the United States. At the end of the year 39 American engineers and technicians and 5 third country nationals were working in Yemen, with 700 Yemeni workmen on the payroll.

Foreign training programs

Study, observation, and training programs for foreign engineers continued to increase during the fiscal year. Public Roads, through the cooperation of the States, counties, cities, and industry, arranged programs for 342 foreign highway officials, engineers, and technicians from 50 countries. A record 719 man-months of study was provided. The International Cooperation Administration sponsored the majority of visitors but many individuals were referred to Public

Roads through the Bureau of Educational and Cultural Exchange, Department of State, United Nations, private foundations, and their own governments' subsidization.

Through an agreement with Public Roads, Ohio inaugurated a group program for 29 ICA-sponsored foreign engineers during March 1961. The visitors, representing 10 countries, started with 9 weeks of intensive study at Ohio State University and at year's end were assigned to the districts of the Ohio Department of Highways for 16 weeks of field practice. A similar group program was being arranged in another State.

Appendix

LIST OF TABLES

Table 1.—Summaries of programs approved and work completed in the fiscal year 1961, by class of highway and by fund

	PROGRAMS APPROVED [1]						WORK COMPLETED					
	Total cost	Federal funds	Miles	Railway-highway grade-crossing improvements: Crossings eliminated	Railway-highway grade-crossing improvements: Structures reconstructed	Railway-highway grade-crossing improvements: Crossings protected	Total cost	Federal funds	Miles	Railway-highway grade-crossing improvements: Crossings eliminated	Railway-highway grade-crossing improvements: Structures reconstructed	Railway-highway grade-crossing improvements: Crossings protected
BY CLASS OF HIGHWAY												
Primary rural:												
Interstate	$1,435,143,365	$1,263,797,845	2,995.6	93	4	4	$1,148,801,675	$1,028,818,585	2,648.1	107	1	
All other	799,424,697	427,325,892	5,904.2	79	9	67	632,159,040	328,580,190	4,909.7	71	7	101
Secondary rural	518,379,829	277,987,084	12,828.2	30	2	208	466,972,709	243,527,716	13,477.4	35	3	228
Urban:												
Interstate	1,418,541,273	1,145,118,578	425.4	70	1	3	751,501,217	590,768,183	369.6	75	1	7
All other	603,242,317	310,685,952	738.2	98	17	74	441,744,928	226,853,238	677.8	72	6	51
Subtotal	4,774,731,481	3,424,915,351	22,891.6	370	33	356	3,441,179,569	2,418,547,912	22,082.6	360	18	387
Not classified [2]	83,744,601	79,611,154	1,955.2	2		3	74,411,648	69,205,482	1,043.9	1		2
Total	4,858,476,082	3,504,526,505	24,846.8	372	33	359	3,515,591,217	2,487,753,394	23,126.5	361	18	389
BY FUND												
Federal aid:												
Primary	$869,031,593	$463,321,175	6,115.0	90	10	80	$675,803,001	$351,008,005	5,060.5	77	8	108
Secondary	535,901,823	286,598,566	12,883.7	32	2	208	468,563,582	242,787,934	13,383.5	35	3	228
Urban	525,759,038	270,884,005	472.5	85	16	61	391,421,766	199,220,281	408.8	65	5	44
Interstate	2,844,039,027	2,404,111,605	3,420.4	163	5	7	1,879,498,333	1,609,217,706	3,017.3	180	2	7
D funds							25,892,887	16,313,986	212.5	3		
Subtotal	4,774,731,481	3,424,915,351	22,891.6	370	33	356	3,441,179,569	2,418,547,912	22,082.6	360	18	387
Defense access roads	21,261,704	20,159,135	1,164.1	2		1	14,449,116	14,024,080	193.5	1		2
National forest highway [3]	27,989,864	26,617,227	457.1				30,916,884	28,812,186	468.7			
National park and parkway [4]	24,635,500	24,635,500	205.9				14,454,847	14,454,847	177.8			
Bureau of Land Management [4]	[5]	[5]	[5]				2,983,550	2,983,550	90.2			
Forest development [4]	[5]	[5]	[5]				2,393,955	2,393,955	32.7			
Public lands	7,086,268	6,612,366	87.4				3,882,299	3,781,866	40.8			
Emergency flood relief	2,771,265	1,586,926	40.7			2	5,330,997	2,754,998	40.2			
Subtotal	83,744,601	79,611,154	1,955.2	2		3	74,411,648	69,205,482	1,043.9	1		2
Total	4,858,476,082	3,504,526,505	24,846.8	372	33	359	3,515,591,217	2,487,753,394	23,126.5	361	18	389

[1] Initial commitment of funds.
[2] Defense access roads, forest, park, Bureau of Land Management, forest development, public lands, and emergency flood-relief projects.
[3] Includes construction projects only.
[4] Construction supervised by Bureau of Public Roads.
[5] Data not available.

Table 2.—Projects under construction or plans approved on June 30, 1961, by class of highway and by fund

	Total cost	Federal funds	Miles	Railway-highway grade-crossing improvements		
				Crossings eliminated	Structures reconstructed	Crossings protected
By Class of Highway						
Primary rural:						
Interstate	$2,850,947,382	$2,516,329,534	4,920.2	220	6	8
All other	1,278,796,966	675,917,183	7,843.4	167	17	89
Secondary rural	855,708,958	451,838,602	17,750.1	79	4	339
Urban:						
Interstate	3,129,542,199	2,622,329,355	772.6	197	3	5
All other	1,153,921,959	597,383,384	1,088.9	197	42	78
Subtotal	9,268,917,464	6,863,798,058	32,375.2	860	72	519
Not classified [1]	169,030,596	160,888,655	2,336.7	3	1	2
Total	9,437,948,060	7,024,686,713	34,711.9	863	73	521
By Fund						
Federal-aid:						
Primary	$1,415,123,663	$746,717,847	8,108.5	190	20	107
Secondary	892,267,050	468,958,354	17,836.3	84	4	339
Urban	1,003,394,904	520,728,147	740.1	169	39	60
Interstate	5,957,402,494	5,126,914,143	5,690.0	416	9	13
D funds	729,353	479,567	.3	1		
Subtotal	9,268,917,464	6,863,798,058	32,375.2	860	72	519
Defense access roads	22,073,128	21,397,733	688.0	3	1	1
National forest highway [2]	50,217,871	46,633,041	761.2			
National park and parkway [3]	53,783,875	53,783,875	401.9			
Bureau of Land Management [3]	11,154,580	11,154,580	276.4			
Forest development [3]	2,399,327	2,399,327	35.8			
National Science Foundation, Kitt Peak Observatory Road [3]	2,823,295	2,823,295	12.1			
Woodrow Wilson Memorial Bridge [3]	13,800,000	13,800,000	1.1			
Public lands	4,182,544	3,770,215	93.9			
Emergency flood relief	8,595,976	5,126,589	66.3			1
Subtotal	169,030,596	160,888,655	2,336.7	3	1	2
Total	9,437,948,060	7,024,686,713	34,711.9	863	73	521

[1] Defense access roads, forest, park, Bureau of Land Management, forest development, National Science Foundation (Kitt Peak Observatory Road), Woodrow Wilson Memorial Bridge, public lands, and emergency flood-relief projects.

[2] Includes construction projects only.

[3] Construction supervised by Bureau of Public Roads.

Table 3.—Projects financed with Federal-aid funds programed [1] during the fiscal year ended June 30, 1961, by State

State or territory	Primary			Secondary			Urban			Interstate			Total		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$13,352,579	$6,677,756	80.2	$14,803,161	$7,206,809	491.0	$4,276,416	$2,226,378	7.7	$41,112,118	$37,033,406	105.2	$73,544,274	$53,144,349	684.1
Alaska	27,027,420	25,263,321	255.9	19,004,115	17,867,226	163.7	210,955	191,867	------	------	------	------	46,242,490	43,322,414	419.6
Arizona	7,842,718	6,072,993	56.2	5,586,210	4,154,210	84.8	1,352,100	905,258	4.4	28,336,654	26,752,266	68.3	43,117,682	37,884,727	213.7
Arkansas	16,822,420	8,915,427	153.5	11,621,516	5,604,488	272.5	1,172,704	719,121	4.5	20,055,838	18,050,254	48.4	49,672,478	33,289,290	478.9
California	49,719,548	26,812,509	56.0	15,997,186	9,082,650	143.4	64,609,975	35,524,875	33.6	376,632,636	218,253,495	92.1	506,959,345	289,673,529	325.1
Colorado	15,116,765	8,559,407	178.1	9,768,320	6,077,171	233.6	3,276,613	1,865,121	5.1	16,001,723	14,595,509	58.7	44,163,421	31,097,208	475.5
Connecticut	5,277,930	2,255,042	8.2	1,314,339	698,267	5.0	866,784	512,117	.2	37,395,973	33,542,633	9.5	44,855,026	37,008,059	22.9
Delaware	1,163,808	581,054	1.4	1,811,130	905,565	4.4	243,346	121,673	------	11,684,716	10,516,244	1.8	14,903,000	12,124,536	7.6
Florida	15,770,956	7,885,478	116.2	4,284,246	2,142,085	73.8	4,480,648	2,289,592	15.5	32,799,983	29,503,838	77.7	57,335,833	41,820,993	283.2
Georgia	20,155,182	10,244,587	166.2	15,263,391	7,573,992	295.5	10,395,208	5,210,504	15.7	79,693,668	71,724,197	104.9	125,507,449	94,753,280	582.3
Hawaii	8,609,161	4,297,194	17.6	1,034,307	555,351	2.3	25,756	12,878	------	7,763,250	6,986,925	1.0	17,432,474	11,852,348	20.9
Idaho	6,866,756	4,587,329	77.8	6,032,918	3,979,394	109.1	10,707	6,763	------	17,369,759	16,110,499	96.9	30,280,140	24,683,985	283.8
Illinois	28,980,830	14,584,698	110.6	18,366,980	9,141,779	373.0	40,969,996	21,241,054	34.4	162,743,509	145,602,223	87.5	251,061,315	190,569,754	605.5
Indiana	26,774,256	13,405,528	191.1	11,546,566	5,795,945	124.3	19,662,896	10,046,323	19.0	46,587,680	41,928,911	48.7	104,571,398	71,176,707	383.1
Iowa	18,797,990	9,528,502	298.5	17,445,120	8,766,038	728.9	2,795,889	1,501,359	9.8	26,028,342	23,485,668	55.9	65,067,341	43,281,567	1,093.1
Kansas	24,288,232	12,215,075	365.0	14,914,509	7,432,509	812.5	4,335,744	2,174,207	10.4	28,695,107	25,804,778	96.9	72,233,592	47,626,569	1,284.8
Kentucky	14,544,217	7,377,162	36.4	13,865,426	6,950,314	132.9	6,829,714	3,586,219	5.5	68,324,276	61,481,888	76.8	103,563,633	79,395,583	251.6
Louisiana	12,436,652	6,225,316	84.5	8,215,596	4,120,403	113.0	7,371,482	4,266,006	10.4	72,117,159	64,809,058	68.1	100,140,889	79,420,783	276.0
Maine	10,223,442	5,253,097	30.7	7,662,067	3,466,137	52.5	2,352,116	1,160,233	3.4	21,087,040	19,003,766	50.6	41,324,665	28,883,233	137.2
Maryland	8,116,000	4,052,600	29.6	4,309,103	2,232,739	133.2	7,894,700	4,022,670	11.1	40,674,256	34,925,647	18.3	60,994,059	45,233,656	192.2
Massachusetts	10,118,877	4,841,216	12.2	4,099,927	2,038,728	7.7	18,640,950	9,073,840	12.3	55,683,108	49,944,997	11.6	88,542,862	65,898,781	43.8
Michigan	26,226,014	13,083,135	213.6	20,167,998	10,158,774	639.3	32,861,433	15,786,937	8.6	137,129,476	119,217,747	144.2	216,384,921	158,246,593	1,005.7
Minnesota	23,450,903	12,109,081	314.8	13,555,557	6,513,048	736.6	5,928,922	3,585,840	10.1	62,175,820	54,774,668	98.5	105,111,202	76,982,637	1,160.0
Mississippi	11,484,802	5,767,825	156.1	10,511,515	4,889,990	326.9	2,791,752	1,875,641	5.6	24,858,999	22,444,876	94.2	49,647,068	34,978,332	582.8
Missouri	24,496,857	12,533,100	100.8	14,491,825	7,254,968	886.1	14,359,498	6,795,495	10.4	95,279,195	85,830,983	93.2	148,627,375	112,414,546	1,090.5
Montana	11,306,690	6,597,975	154.4	11,177,352	6,495,953	186.6	545,243	395,960	3.4	33,213,421	30,294,628	132.7	56,242,706	43,784,516	477.1
Nebraska	15,378,473	7,873,753	229.8	11,732,440	5,893,472	399.3	3,686,833	2,081,758	2.3	49,769,028	44,824,321	177.0	80,566,774	60,673,304	808.4
Nevada	5,734,466	5,134,470	63.3	5,056,955	4,534,608	74.5	5,821	5,234	------	17,753,034	16,865,369	75.9	28,550,276	26,539,681	213.7
New Hampshire	3,724,723	1,856,789	10.9	2,758,620	1,428,435	15.0	392,141	194,006	.8	16,043,334	13,909,481	13.0	22,918,818	17,388,711	39.7
New Jersey	1,558,610	779,305	5.6	3,171,199	1,574,393	6.4	13,467,350	6,733,675	4.0	84,381,963	70,157,837	18.0	102,579,122	79,245,210	34.0
New Mexico	11,247,258	6,686,084	59.6	7,180,594	4,611,262	90.8	1,391,582	945,217	1.1	24,866,398	22,791,852	72.2	44,685,832	35,034,415	223.7
New York	37,515,695	18,015,315	120.5	13,949,994	6,342,679	68.1	87,708,917	42,323,867	57.6	152,572,405	134,349,429	65.9	291,747,011	201,031,290	312.1

North Carolina	32,143,521	15,958,772	229.0	18,650,244	8,651,658	387.3	5,004,546	2,517,823	6.4	28,579,070	25,217,940	87.3	84,377,381	52,346,193	710.0
North Dakota	8,035,298	4,030,329	160.5	9,065,833	4,562,201	741.8	1,168,790	596,395	3.0	6,058,325	5,482,052	33.6	21,328,246	14,670,977	938.9
Ohio	34,738,382	18,175,559	49.1	24,871,250	13,061,022	109.4	25,164,401	13,664,193	16.4	170,676,163	149,835,817	54.1	255,450,196	194,736,591	229.0
Oklahoma	23,879,694	11,943,888	179.8	11,320,934	5,807,883	384.3	3,469,665	1,767,024	10.6	17,169,324	15,388,391	46.3	55,839,617	34,907,186	621.0
Oregon	11,365,164	6,922,591	41.9	4,684,612	2,824,124	141.7	6,808,024	2,719,761	5.3	54,553,826	45,698,538	136.5	77,411,626	58,165,014	325.4
Pennsylvania	54,750,518	27,375,259	100.2	25,040,332	12,456,166	83.1	34,634,236	17,010,368	23.3	149,769,376	133,904,676	102.8	264,194,462	190,746,469	309.4
Rhode Island	8,754,235	4,376,302	19.9	3,229,023	1,574,667	9.8	69,120	34,560	------	2,064,831	1,854,487	-------	14,117,209	7,840,016	29.7
South Carolina	11,170,079	5,689,133	109.6	7,438,379	3,511,939	436.8	3,668,887	2,041,132	13.2	16,126,768	14,569,696	33.0	38,404,113	25,811,900	592.6
South Dakota	11,329,219	6,267,311	243.1	5,994,664	3,431,397	379.4	1,498,108	828,752	3.7	9,264,097	8,430,243	36.0	28,086,088	18,957,703	662.2
Tennessee	18,555,166	9,276,583	145.7	9,577,828	4,807,314	455.7	7,895,592	3,947,796	9.3	80,909,211	72,818,273	150.5	116,937,797	90,849,966	761.2
Texas	48,087,384	25,050,000	568.8	33,695,059	17,059,150	898.5	23,256,853	12,405,300	34.1	113,380,686	88,001,445	127.1	218,419,982	142,515,895	1,628.5
Utah	6,936,245	5,285,492	67.3	5,126,926	3,745,894	74.3	1,281,522	964,935	3.9	26,318,284	24,879,966	36.6	39,662,977	34,876,287	182.1
Vermont	5,330,206	2,651,427	12.9	2,857,118	1,423,834	27.9	241,294	120,647	------	19,164,907	17,203,157	20.5	27,593,525	21,399,065	61.3
Virginia	17,906,277	9,073,678	80.1	13,815,316	7,191,367	181.2	10,041,304	5,177,398	13.6	118,201,752	106,153,274	112.7	159,964,649	127,595,717	387.6
Washington	16,885,587	7,271,640	75.6	8,779,467	4,431,734	225.9	6,675,517	3,569,796	7.1	35,066,647	31,501,808	28.4	67,407,218	46,774,978	337.0
West Virginia	7,680,357	3,840,178	73.0	10,299,120	5,148,678	32.2	1,289,500	644,750	1.0	31,333,189	28,199,870	30.7	50,602,166	37,833,476	136.9
Wisconsin	21,933,467	10,967,252	160.2	12,047,258	5,932,192	372.8	12,113,768	6,204,705	8.7	40,746,215	36,768,496	105.4	86,840,708	59,872,645	647.1
Wyoming	6,096,772	4,116,442	35.1	7,367,985	4,874,716	152.8	300,706	199,517	2.5	16,851,187	15,650,196	112.8	30,616,650	24,840,871	303.2
District of Columbia	6,136,457	3,453,729	1.0	1,125,945	530,059	2.0	11,973,837	6,944,856	2.3	18,975,301	17,035,887	2.4	38,211,540	27,964,531	7.7
Puerto Rico	3,187,335	1,523,487	6.9	214,348	83,189	.1	4,289,177	2,142,609	1.2	----------	----------	-------	7,690,860	3,749,285	8.2
Total	869,031,593	463,321,175	6,115.0	535,901,823	286,598,566	12,883.7	525,759,038	270,884,005	472.5	2,844,039,027	2,404,111,605	3,420.4	4,774,731,481	3,424,915,351	22,891.6

[1] Initial commitment of funds.

Table 4.—Projects involving Federal funds awarded to contract [1] during the fiscal year ended June 30, 1961, by program and by State

State or territory	Total cost	Total Federal funds	Federal-aid funds				Access funds	Miles
			Primary [2]	Secondary	Urban [3]	Interstate		
Alabama	$75,826,267	$53,544,511	$7,166,642	$6,535,137	$4,037,659	$35,805,073		652.1
Alaska	19,181,416	16,828,468	9,674,500	6,962,133	191,835			170.8
Arizona	38,914,546	34,068,527	5,612,434	4,020,230	923,303	23,442,281	$70,279	195.5
Arkansas	39,165,045	24,820,030	6,326,317	5,896,465	978,066	11,554,660	64,522	478.8
California	515,018,574	303,348,232	25,973,600	12,447,588	26,753,400	236,947,044	1,226,600	423.0
Colorado	44,766,656	31,488,072	7,396,032	5,262,129	1,926,549	16,801,712	101,650	392.8
Connecticut	48,586,416	38,177,893	2,905,781	839,781	2,454,920	31,799,610	177,801	32.8
Delaware	15,025,700	13,148,886	33,404	105,565	306,673	12,703,244		2.0
Florida	35,746,118	26,720,497	3,691,262	2,403,208	700,957	19,925,070		198.2
Georgia	90,411,197	64,736,154	11,330,352	6,810,260	3,412,656	40,606,100	2,576,786	486.0
Hawaii	8,873,975	6,409,363	1,656,694	362,866	12,878	4,376,925		5.6
Idaho	24,009,677	19,349,507	3,532,958	2,938,059	114,293	12,201,127	563,070	236.7
Illinois	195,691,681	138,384,198	16,642,960	10,539,461	21,582,844	89,204,733	414,200	641.0
Indiana	108,656,058	74,983,408	15,577,153	4,323,697	9,243,216	45,546,902	292,530	409.0
Iowa	60,048,306	36,063,555	11,211,889	8,920,910	2,742,103	13,188,653		1,133.6
Kansas	71,856,467	49,577,895	10,073,804	8,173,992	1,044,967	27,254,206	3,030,926	1,331.3
Kentucky	91,612,533	69,988,232	7,206,810	5,081,985	4,235,529	53,463,908		214.1
Louisiana	81,555,648	62,776,923	5,696,586	4,267,643	3,996,096	48,816,598		299.1
Maine	22,197,656	14,449,374	3,827,227	1,866,128	908,013	7,650,656	197,350	77.7
Maryland	59,593,746	44,562,992	2,987,500	1,990,342	5,353,988	34,231,162		170.6
Massachusetts	82,859,268	64,006,160	2,672,277	1,148,415	8,793,102	51,053,483	338,883	47.7
Michigan	228,379,934	167,837,038	15,326,331	7,885,742	17,789,997	126,828,968	6,000	873.3
Minnesota	71,648,256	45,737,903	12,119,503	7,187,282	4,515,821	21,775,769	139,528	1,194.1
Mississippi	42,931,303	29,135,332	5,929,560	4,812,107	578,026	17,311,339	504,300	559.3
Missouri	122,642,750	91,038,777	12,247,003	8,792,562	3,262,961	66,596,037	140,214	1,192.3
Montana	46,817,786	35,922,661	7,606,607	4,596,802	364,650	22,426,902	927,700	584.7
Nebraska	61,445,516	44,082,387	8,061,834	4,711,345	2,969,018	26,652,741	1,687,449	611.5
Nevada	18,180,755	16,548,664	6,994,769	1,594,803	27,224	7,903,868	28,000	126.4
New Hampshire	23,683,945	17,369,473	2,469,236	1,408,079	196,528	13,255,630	40,000	45.6
New Jersey	93,936,656	70,946,777	1,779,180	3,049,777	4,567,455	61,535,365	15,000	48.7
New Mexico	35,265,486	26,274,558	6,912,510	4,604,707	396,549	14,181,794	178,998	204.8
New York	300,861,359	214,145,104	17,322,977	5,514,580	35,675,182	155,492,065	140,300	295.2

North Carolina	74,861,014	46,733,216	14,617,793	6,635,811	1,487,551	23,992,061		640.0
North Dakota	29,501,574	18,995,921	4,066,326	4,661,596	883,594	9,384,405		1,017.8
Ohio	263,981,056	207,577,342	18,491,579	10,707,573	12,812,800	165,287,146	278,244	213.9
Oklahoma	64,949,238	42,468,182	13,428,641	5,256,461	1,805,437	21,853,545	124,098	658.7
Oregon	74,947,655	57,452,995	8,234,370	3,641,015	2,344,783	43,232,827		312.1
Pennsylvania	159,404,300	114,783,243	15,685,673	9,181,751	10,493,591	79,107,078	315,150	179.7
Rhode Island	8,937,989	4,830,238	2,740,802	1,127,767	34,560	927,109		13.0
South Carolina	42,997,697	28,938,143	5,869,954	4,628,246	1,886,283	16,553,660		681.8
South Dakota	53,168,208	42,104,744	5,851,960	3,903,728	215,030	30,565,908	1,568,118	1,156.0
Tennessee	97,187,618	73,361,281	6,708,385	7,110,368	3,866,350	55,601,920	74,258	825.8
Texas	220,708,950	145,728,280	25,404,500	15,130,700	13,086,300	92,104,880	1,900	1,582.8
Utah	32,944,757	28,739,869	5,246,402	3,855,505	275,111	17,808,848	1,554,003	199.2
Vermont	27,018,666	20,858,660	2,587,473	1,495,555	142,669	16,624,963	8,000	61.3
Virginia	145,825,776	114,630,988	8,869,318	8,090,989	4,849,211	92,137,524	683,946	472.8
Washington	75,655,497	52,883,653	9,044,581	4,836,825	3,330,458	34,266,386	1,405,403	436.3
West Virginia	37,903,408	27,134,866	2,958,878	4,612,125	978,621	18,585,242		165.8
Wisconsin	90,278,929	63,577,512	10,579,832	5,937,920	5,992,225	41,063,535	4,000	728.2
Wyoming	36,607,056	30,321,436	4,604,402	4,680,569	198,822	20,384,643	453,000	317.0
District of Columbia	43,251,194	32,972,112	3,252,117	1,119,776	6,881,131	21,719,088		7.9
Puerto Rico	8,317,770	3,868,146	142,581	633,448	3,082,605		9,512	12.9
Total	4,363,839,048	3,104,432,378	426,351,259	262,301,418	244,703,590	2,151,734,393	19,341,718	23,017.3

[1] Includes preliminary engineering, right-of-way, and force-account projects on which work was started during the fiscal year.

[2] Funds available for either rural or urban portions of the Federal-aid primary highway system.

[3] Funds available for primary system or urban extensions of secondary system.

Table 5.—Status of Federal-aid projects [1] as of June 30, 1961, and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$60,651,442	$41,173,292	93.9	$26,372,721	$20,042,984	261.8	$164,682,089	$117,193,032	821.9	$76,232,571	$57,478,235	688.0
Alaska	35,505,375	33,562,266	373.9	10,781,304	10,115,664	95.9	36,830,346	32,436,083	158.4	16,731,967	14,013,085	132.2
Arizona	23,635,858	21,493,541	75.6	15,437,501	12,781,848	47.2	59,642,168	53,153,605	212.5	40,372,654	35,239,785	221.5
Arkansas	41,023,146	31,384,440	255.4	21,271,040	14,925,647	174.0	120,335,814	90,699,166	612.8	26,799,548	17,555,656	389.3
California	44,553,425	31,487,068	26.0	98,699,893	75,185,376	106.3	753,682,477	487,208,735	348.8	265,151,295	149,442,651	381.8
Colorado	10,887,530	7,795,343	91.4	10,359,491	7,573,980	134.2	52,602,233	33,702,655	303.7	40,283,528	28,093,809	406.9
Connecticut	98,000	88,200		4,946,658	2,942,795	1.6	134,330,010	105,783,676	77.1	42,279,502	25,241,601	38.5
Delaware	8,359,234	6,885,507	7.5	17,142,601	14,323,843	9.8	19,786,600	16,333,486	.8	11,764,750	7,505,969	71.5
Florida	22,935,845	14,820,843	167.2	15,437,464	11,572,003	63.1	82,477,508	68,277,421	219.5	104,595,127	76,931,564	294.7
Georgia	119,676,881	100,572,352	319.1	28,519,567	16,321,918	202.1	224,351,164	165,847,307	931.4	70,770,099	46,833,714	409.0
Hawaii	10,174,820	5,943,035	20.0	496,169	287,589	2.1	11,789,980	7,690,756	5.2	8,012,764	3,859,789	13.3
Idaho	16,022,351	14,122,008	73.6	11,735,083	9,542,921	135.5	41,239,783	33,573,879	260.2	26,559,037	21,193,193	200.2
Illinois	74,830,109	63,228,665	70.4	75,452,982	56,677,047	98.2	449,107,234	342,346,847	930.1	172,844,396	123,397,855	706.0
Indiana	46,922,525	33,269,498	115.8	17,631,743	12,581,762	97.6	196,320,124	144,573,334	410.8	114,473,435	78,419,827	533.4
Iowa	13,478,268	11,300,730	36.8	18,001,700	13,258,015	148.3	83,036,887	56,375,882	1,153.1	63,130,927	46,491,776	718.6
Kansas	14,095,962	9,142,499	221.8	14,600,028	9,572,513	219.1	66,311,593	46,553,401	1,242.1	59,891,026	40,103,035	1,217.2
Kentucky	30,461,544	24,847,444	43.5	32,733,200	24,644,299	115.5	156,428,024	118,932,926	341.6	75,514,450	56,496,123	213.9
Louisiana	31,594,259	28,280,407	15.9	34,767,380	28,171,663	100.0	229,104,399	173,163,422	535.6	44,156,596	23,116,652	244.8
Maine	23,132,490	16,758,965	65.6	6,043,301	4,142,431	32.1	33,171,915	23,162,220	94.5	31,280,724	25,343,846	95.9
Maryland	25,576,388	20,679,619	15.7	23,731,133	15,800,233	110.4	100,576,836	78,971,408	174.1	25,394,976	16,632,846	137.3
Massachusetts	22,655,368	19,692,787	4.0	69,564,225	47,640,408	53.1	185,587,503	139,533,685	88.0	105,341,930	75,796,458	68.4
Michigan	6,900,140	3,897,968	30.6	42,026,709	23,696,173	444.9	358,278,743	276,358,520	916.4	152,380,778	117,184,198	784.5
Minnesota	51,079,528	46,228,694	35.9	21,830,287	17,530,138	131.7	228,415,475	171,252,870	1,728.9	64,460,467	44,726,049	1,083.7
Mississippi	36,313,324	28,756,911	175.8	20,677,936	15,794,690	205.8	106,764,529	79,104,231	765.2	54,568,909	37,394,498	730.1
Missouri	44,449,948	36,450,271	232.0	25,198,210	17,334,640	197.8	205,140,230	154,192,365	1,161.2	71,392,343	45,245,857	1,045.9
Montana	17,865,239	14,962,552	144.2	22,670,858	17,511,884	194.4	86,632,024	68,692,124	528.3	37,610,813	27,807,412	462.2
Nebraska	23,940,450	20,256,706	131.1	55,353,603	41,771,205	471.4	73,108,961	52,407,732	914.2	30,278,069	21,534,184	274.4
Nevada	12,690,196	11,937,789	65.8	7,462,636	6,910,244	75.4	59,130,707	54,805,506	187.7	4,396,647	3,719,438	76.2
New Hampshire	5,499,291	4,593,132	6.8	6,515,272	5,275,687	14.0	31,568,989	23,566,297	48.7	31,512,449	24,845,912	63.3
New Jersey	26,630,100	20,865,736	26.4	45,228,787	37,219,163	32.8	232,827,781	175,488,098	77.3	61,152,977	47,009,437	56.7
New Mexico	16,983,313	14,223,745	57.5	6,546,074	5,671,651	30.9	51,884,331	41,690,436	218.0	25,640,853	19,495,414	201.5
New York	36,215,648	21,865,652	41.0	125,388,908	86,818,780	155.2	678,487,346	491,230,324	485.8	214,162,006	134,485,468	434.6

North Carolina	37,316,907	25,580,354	89.7	19,929,245	13,849,395	231.7	94,384,552	63,587,584	588.4	63,096,470	43,946,145	613.8
North Dakota	3,363,352	1,971,502	148.0	2,229,900	1,356,832	127.4	41,228,283	28,283,004	906.5	36,221,813	23,680,229	1,311.2
Ohio	502,100	451,890	----------	82,500,302	56,656,271	122.4	317,112,688	233,990,330	353.3	197,404,369	152,471,733	201.7
Oklahoma	18,527,678	11,619,381	161.2	23,173,161	14,853,261	283.8	78,466,726	54,339,998	659.8	48,139,349	32,222,865	638.7
Oregon	19,263,246	14,608,123	41.0	16,337,837	12,797,000	133.8	126,709,401	104,741,494	319.0	50,728,180	38,224,535	354.9
Pennsylvania	172,745,393	125,991,885	162.0	74,475,397	56,918,461	137.9	240,813,032	172,039,638	278.4	145,673,054	101,886,108	201.0
Rhode Island	5,103,000	3,045,900	14.8	1,116,440	600,935	3.4	38,570,596	28,555,490	15.0	16,522,714	10,101,269	22.1
South Carolina	23,213,720	15,075,569	173.2	10,052,434	6,731,658	199.6	89,051,973	64,101,210	1,035.7	65,345,730	50,715,351	838.7
South Dakota	22,415,901	17,196,972	216.5	6,247,394	4,029,877	142.0	59,204,182	49,329,285	697.9	44,030,382	32,182,807	768.5
Tennessee	51,912,587	41,798,211	153.7	27,486,873	17,964,404	314.7	246,937,657	197,906,185	719.0	66,152,793	47,640,405	726.4
Texas	35,341,300	29,341,850	96.8	52,222,018	35,820,675	307.3	360,227,302	260,062,010	1,645.9	202,840,649	142,637,483	1,620.1
Utah	20,706,655	18,491,184	74.8	17,716,211	15,120,426	86.2	50,427,303	45,130,710	162.3	28,683,227	24,902,727	170.1
Vermont	1,039,438	777,894	6.1	4,404,003	3,458,038	8.7	52,559,028	42,718,337	87.5	32,470,517	25,735,074	64.1
Virginia	27,129,770	22,544,405	27.3	22,712,863	15,989,811	103.7	282,239,879	231,859,005	552.6	44,644,212	30,899,996	343.6
Washington	17,059,465	10,962,350	68.9	13,423,244	6,407,017	77.6	113,982,342	86,537,722	380.8	46,229,764	34,325,719	372.0
West Virginia	59,675,104	46,622,764	85.4	29,957,223	21,451,069	92.4	96,007,506	69,603,913	147.0	42,293,374	32,449,692	424.3
Wisconsin	24,693,626	20,199,094	59.9	24,940,330	15,903,535	139.5	109,365,969	77,573,254	595.1	76,126,734	51,390,865	713.1
Wyoming	5,698,528	5,258,042	22.0	12,565,948	10,509,488	89.6	60,596,193	50,782,567	421.0	33,748,015	28,278,393	283.2
District of Columbia	7,787,128	5,400,335	4.1	16,526,049	13,331,684	2.4	75,887,378	56,082,384	10.4	25,190,117	19,256,246	11.3
Puerto Rico	15,534,634	7,713,367	21.9	1,208,179	548,132	4.1	29,662,156	14,332,346	75.3	6,500,493	2,964,934	8.3
Total	1,523,867,529	1,185,218,737	4,667.5	1,391,849,515	1,007,940,163	6,770.4	7,877,067,949	5,855,857,895	25,604.8	3,441,179,569	2,418,547,912	22,082.6

[1] Includes projects financed from Federal-aid primary, secondary, urban, D and Interstate funds.

[2] Initial commitment of funds.

Table 6.—Mileage of Federal-aid highway projects completed during fiscal year 1961, by program and by number of lanes

State or territory	Primary program			Secondary program [1]	Urban program			Interstate program			D program	
	2 lanes	4 lanes	6 lanes or more		2 lanes	4 lanes	6 lanes or more	2 lanes	4 lanes	6 lanes or more	2 lanes	4 lanes
Alabama	67.8	44.0		401.9	4.1	13.0			148.4		8.7	
Alaska	44.1	1.7		67.9							17.1	1.4
Arizona	41.8	2.0		69.3		7.9		17.9	77.4	5.2		
Arkansas	56.9	7.3		293.1	5.2	.4		.2	24.8	.3		
California	17.1	38.1	0.4	254.7		2.4	9.1	.1	29.5	31.2	.3	
Colorado	118.6	6.3		191.6	.9	2.5	1.9	31.3	53.9			
Connecticut	4.5	6.4		10.8		10.2			6.2	.3		
Delaware	20.0	16.5		27.6	.7	6.4			.1	.1		
Florida	17.3	62.4		122.8		9.1	.8		76.5	5.8		
Georgia	108.2	29.5		201.5		6.2			53.5	2.3	7.8	
Hawaii	1.7			10.5		1.0	.2					
Idaho	17.5	5.3		113.1				18.2	36.4		9.7	
Illinois	155.2	30.1		445.9	.6	28.3	1.1		40.7	4.1		
Indiana	241.7	44.6	.9	152.9	.8	7.3	1.9		83.0	.1	.3	
Iowa	233.2	15.6		381.5	3.9	5.2			75.2	4.0		
Kansas	225.1	7.6		885.6		6.0			91.9	1.0		
Kentucky	18.5	13.2		107.7	1.1	1.7			38.2	25.2	8.3	
Louisiana	26.2	14.8		179.4	2.7	11.8		.2	9.1	.6		
Maine	20.5			25.7					49.6			
Maryland	9.2	10.2		89.7	.9	9.0			17.8	.6		
Massachusetts	5.0	10.9		6.0	3.1	2.0	5.7		6.8	24.4	4.5	
Michigan	231.4	14.7		421.3	1.3	9.5	4.3		101.9	.2		
Minnesota	62.5	67.1		883.1	.7	8.7			28.3		19.5	13.9
Mississippi	134.0	56.7		452.4		3.2	.2		83.5			
Missouri	128.2	10.2		832.7		5.0	.2		66.7	2.8		
Montana	194.9	1.0		195.9				31.5	29.5		9.4	
Nebraska	94.3			151.1		2.8			25.3	1.0		
Nevada	38.0			38.1								
New Hampshire	14.3	.6		13.8	1.4	.5		9.9	22.8			
New Jersey	2.3	8.0		15.2		9.2			3.2	18.8		
New Mexico	4.5	22.2	1.6	129.9		1.0			42.3			
New York	169.1	23.8		120.7	7.5	12.1	9.9		53.8	6.1	26.8	4.9

North Carolina	62.0	52.6		363.5	2.4	6.0	.7	4.8	121.8			
North Dakota	168.8	6.2		1,041.4		1.6		15.2	67.6		10.4	
Ohio	38.5	32.0		26.3	.6	13.2	.6	.1	50.5	32.6	7.3	
Oklahoma	88.4	9.7		452.7	4.3	10.5	2.4		69.0	1.7		
Oregon	55.6	9.2		169.6	1.9	1.6		21.1	92.1	3.1	.6	
Pennsylvania	7.3	28.5		50.8	1.9	19.0	.6		92.9			
Rhode Island	1.4	5.6		11.1	.7	2.0			.6	.7		
South Carolina	41.5	14.2		586.7		3.4			142.4	.2	50.2	
South Dakota	258.4	14.1		421.5	2.5	1.3		17.6	53.1			
Tennessee	65.1	30.3		551.3		2.6			77.0			
Texas	357.6	108.6		948.3	6.5	28.5	17.1	.5	137.7	15.2		
Utah	38.4	1.7		64.7		.8		5.7	43.8	15.1		
Vermont	20.5			25.6	2.2				15.9			
Virginia	10.6	28.2		272.6	1.1	2.9	.4		27.8			
Washington	74.8	10.5		245.5	.7	4.7		.1	24.8	8.1	2.9	
West Virginia	73.5	5.9		317.4	1.2				25.5		.7	
Wisconsin	146.6	5.5		454.2		2.6	.2	.1	95.4	.8	7.8	
Wyoming	82.4	3.0		81.3		4.1		27.0	85.4			
District of Columbia	.3	.1	2.5	2.1		.1	1.6		3.8	.8		
Puerto Rico	3.1			3.5		1.7						
Total	4,118.4	936.7	5.4	13,383.5	60.9	289.0	58.9	201.5	2,603.4	212.4	192.3	20.2

[1] Total mileage completed, principally 2-lane construction.

Table 7.—Lane classification of mileage of Federal-aid highway projects completed during fiscal year 1961, by class of fund

Number of lanes	Mileage							Total lane miles
	Primary	Secondary	Urban	Interstate	D funds			Total
					Primary	Secondary	Urban	
2-lane	4,118.4	[1] 13,383.5	60.9	201.5	52.9	139.4		17,956.6	35,913.2
4-lane	936.7		289.0	2,603.4	11.4		8.8	3,849.3	15,397.2
6 lanes and over	5.4		58.9	212.4				276.7	1,660.2
Total	5,060.5	13,383.5	408.8	3,017.3	64.3	139.4	8.8	22,082.6	[2] 52,970.6

[1] Total mileage completed, principally 2-lane construction.
[2] 6-lane-and-over mileage was all converted to lane miles on the basis of 6 lanes.

Table 8.—Apportionment of Federal-aid highway funds authorized for the fiscal year ending June 30, 1962

State or territory	Primary ($416,250,000)	Secondary ($277,500,000)	Urban ($231,250,000)	Subtotal ($925,000,000)	Interstate ($2,200,000,000)	Total ($3,125,000,000)
Alabama	$6,997,371	$5,973,101	$3,054,979	$16,025,451	$42,706,125	$58,731,576
Alaska	22,091,082	14,764,171	119,584	36,974,837		36,974,837
Arizona	6,044,237	3,754,351	1,701,890	11,500,478	29,582,438	41,082,916
Arkansas	5,640,916	4,225,812	1,251,517	11,118,245	21,504,656	32,622,901
California	19,660,098	9,303,650	24,529,637	53,493,385	220,070,812	273,564,197
Colorado	6,303,072	4,444,053	2,299,594	13,046,719	16,783,594	29,830,313
Connecticut	2,372,021	1,342,034	3,726,671	7,440,726	26,420,625	33,861,351
Delaware	1,904,438	1,266,052	531,031	3,701,521	7,623,000	11,324,521
Florida	6,794,538	4,538,164	7,407,962	18,740,664	56,111,344	74,852,008
Georgia	9,306,864	7,453,057	3,704,530	20,464,451	52,256,531	72,720,982
Hawaii	1,776,483	1,373,625	858,573	4,008,681	12,375,000	16,383,681
Idaho	4,529,748	3,001,617	495,333	8,026,698	14,942,813	22,969,511
Illinois	13,618,919	8,299,634	14,721,936	36,640,489	111,053,250	147,693,739
Indiana	8,091,532	6,728,628	5,190,393	20,010,553	62,456,625	82,467,178
Iowa	8,625,049	6,619,922	2,397,138	17,642,109	20,551,781	38,193,890
Kansas	8,767,312	6,109,832	2,174,742	17,051,886	19,382,344	36,434,230
Kentucky	6,315,481	5,165,537	2,309,261	13,790,279	38,071,688	51,861,967
Louisiana	5,928,550	3,902,531	3,620,660	13,451,741	57,194,156	70,645,897
Maine	2,677,905	2,281,365	784,972	5,744,242	11,131,313	16,875,555
Maryland	3,235,237	2,442,528	4,182,692	9,860,457	48,791,531	58,651,988
Massachusetts	4,350,195	2,272,474	7,755,771	14,378,440	60,312,656	74,691,096
Michigan	12,752,648	7,910,128	10,490,144	31,152,920	85,109,062	116,261,982
Minnesota	10,614,871	7,284,743	3,792,222	21,691,836	40,822,031	62,513,867
Mississippi	6,471,046	5,427,160	1,358,493	13,256,699	23,778,563	37,035,262
Missouri	9,915,498	6,980,559	5,140,259	22,036,316	61,785,281	83,821,597
Montana	7,156,820	4,953,906	529,541	12,640,267	24,623,156	37,263,423
Nebraska	6,956,734	5,053,590	1,333,917	13,344,241	13,361,906	26,706,147
Nevada	4,615,457	3,126,594	348,977	8,091,028	11,326,219	19,417,247
New Hampshire	2,060,438	1,373,625	611,876	4,045,939	11,910,938	15,956,877
New Jersey	4,904,496	2,006,565	9,668,607	16,579,668	70,079,625	86,659,293
New Mexico	6,319,289	3,994,476	1,118,268	11,432,033	25,944,188	37,376,221
New York	16,630,975	7,565,208	25,788,261	49,984,444	107,263,406	157,247,850

North Carolina	8,575,231	8,515,225	3,017,790	20,108,246	11,737,688	31,845,934
North Dakota	5,040,825	3,440,815	406,366	8,888,006	9,593,719	18,481,725
Ohio	13,250,791	7,651,857	12,761,004	33,663,652	141,068,812	174,732,464
Oklahoma	7,781,061	5,477,774	2,302,990	15,561,825	19,685,531	35,247,356
Oregon	6,126,359	4,253,108	1,835,268	12,214,735	37,530,281	49,745,016
Pennsylvania	13,138,701	9,058,526	14,663,504	36,860,731	88,314,187	125,174,918
Rhode Island	1,872,058	1,223,696	1,408,207	4,503,961	10,091,813	14,595,774
South Carolina	5,291,049	4,620,450	1,656,641	11,568,140	17,844,750	29,412,890
South Dakota	5,376,276	4,121,050	420,555	9,917,881	9,182,250	19,100,131
Tennessee	7,348,321	5,900,835	3,267,337	16,516,493	64,232,437	80,748,930
Texas	22,811,515	15,071,201	12,554,875	50,437,591	97,842,937	148,280,528
Utah	4,546,375	2,949,540	1,206,623	8,702,538	20,248,594	28,951,132
Vermont	1,849,144	1,329,019	321,538	3,499,701	20,421,844	23,921,545
Virginia	7,215,143	5,300,327	4,010,378	16,525,848	91,757,531	108,283,379
Washington	6,046,144	4,260,733	3,468,233	13,775,110	39,219,469	52,994,579
West Virginia	3,884,521	3,062,586	1,176,353	8,123,460	27,135,281	35,258,741
Wisconsin	8,688,009	6,034,452	4,264,732	18,987,193	22,804,031	41,791,224
Wyoming	4,241,038	3,141,480	272,937	7,655,455	22,500,844	30,156,299
District of Columbia	1,822,103	1,246,023	1,452,072	4,520,198	21,461,344	25,981,542
Puerto Rico	1,905,505	2,276,858	1,503,266	5,685,629		5,685,629

Table 9.—Federal highway funds paid by Bureau of Public Roads during fiscal year ended June 30, 1961, by program and by State

State or territory	Primary [1]	Secondary	Urban	Subtotal	Interstate	D fund	L fund	Total
Alabama	$11,700,813	$6,066,371	$4,922,662	$22,689,846	$35,630,218	$654,839	$274,008	$59,248,911
Alaska	4,823,845	4,723,428	65	9,547,338		345,683	18,847	9,911,868
Arizona	6,683,354	3,830,480	715,664	11,229,498	19,770,461	71,953	11,732	31,083,644
Arkansas	4,870,030	5,068,575	1,677,648	11,616,253	19,048,656			30,664,909
California	17,375,400	11,308,155	15,647,951	44,331,506	167,665,476	71,846	80,420	212,149,248
Colorado	6,909,375	5,585,949	2,432,938	14,928,262	14,505,040	210,152	33,646	29,677,100
Connecticut	5,877,360	1,884,662	4,522,057	12,284,079	23,426,162	444,217	128,388	36,282,846
Delaware	725,753	894,199	364,975	1,984,927	3,872,296	42,471	47,157	5,946,851
Florida	4,567,463	3,238,593	3,220,119	11,026,175	62,749,582	370,752	−76,587	74,069,922
Georgia	9,757,582	7,694,841	2,216,420	19,668,843	37,151,256	−723,464	772,091	56,868,726
Hawaii	2,732,880	990,240	225,970	3,949,090		182,318	44,765	4,176,173
Idaho	4,550,232	1,701,396	410,968	6,662,596	12,744,706	111,317	19,168	19,537,787
Illinois	22,433,476	9,968,750	19,702,887	52,105,113	115,560,087	873,056	237,290	168,775,546
Indiana	15,162,308	7,003,431	8,540,964	30,706,703	51,798,132	382,346	124,586	83,011,767
Iowa	7,830,766	4,973,896	2,697,603	15,502,265	23,685,409	262,326	87,503	39,537,503
Kansas	7,726,812	7,579,335	1,193,561	16,499,708	23,324,205	165,941	49,087	40,038,941
Kentucky	8,755,153	4,399,620	1,601,161	14,755,934	27,319,370	287,309	92,844	42,455,457
Louisiana	6,094,022	4,806,095	3,951,052	14,851,169	37,038,490	538,277	104,881	52,532,817
Maine	2,625,314	2,044,284	751,016	5,420,614	10,081,422	475,001	146,450	16,123,487
Maryland	1,628,676	1,583,501	5,451,379	8,663,556	24,307,382	225,000		33,195,938
Massachusetts	4,446,550	1,709,742	6,343,200	12,499,492	32,574,830	−775,957	1,363,357	45,661,722
Michigan	12,398,424	6,959,428	14,827,396	34,185,248	66,800,092	885,416	35,184	101,905,940
Minnesota	10,495,285	8,092,196	4,833,969	23,421,450	41,705,979	229,025	3,960	65,360,414
Mississippi	6,447,451	4,496,339	1,184,751	12,128,541	27,055,644	638,126	18,000	39,840,311
Missouri	12,369,797	8,152,955	8,154,401	28,677,153	33,505,269			62,182,422
Montana	5,629,131	5,756,331	302,055	11,688,017	16,035,900	538,229	191,317	28,453,463
Nebraska	7,538,020	5,064,464	725,672	13,328,156	26,897,083	225,610	22,705	40,473,554
Nevada	5,067,288	1,605,259	273,096	6,945,643	5,219,940	17,864		12,183,447
New Hampshire	2,146,065	1,506,774	726,996	4,379,835	11,871,466	48,037		16,299,338
New Jersey	3,605,159	1,673,206	8,026,930	13,305,295	34,396,215	543,943	311,741	48,557,194
New Mexico	5,588,258	6,820,734	255,686	12,664,678	14,932,142	27,694	575	27,625,089
New York	22,921,025	8,612,954	31,159,573	62,693,552	94,902,959	962,697	166,702	158,725,910

North Carolina	8,811,842	7,965,227	2,118,278	18,895,347	20,252,625	534,251	178,295	39,860,518
North Dakota	5,246,411	6,085,683	573,591	11,905,685	12,121,748	5,000		24,032,433
Ohio	14,396,900	8,728,909	17,414,106	40,539,915	93,223,054	801,264	255,171	134,819,404
Oklahoma	8,080,240	5,095,370	2,368,845	15,544,455	20,206,704	468,648	158,149	36,377,956
Oregon	4,804,745	4,813,926	864,731	10,483,402	24,744,661	421,391	38,516	35,687,970
Pennsylvania	12,116,676	7,043,810	9,742,573	28,903,059	55,184,398	1,574,649	479,852	86,141,958
Rhode Island	1,562,371	1,548,623	1,830,989	4,941,983	6,248,227	348,546	106,216	11,644,972
South Carolina	5,676,240	5,496,408	1,552,594	12,725,242	26,021,445	278,629		39,025,316
South Dakota	6,452,889	4,526,360	375,917	11,355,166	18,085,569	422,251	59,722	29,922,708
Tennessee	4,890,389	6,441,601	2,062,300	13,394,290	56,129,957			69,524,247
Texas	21,839,100	15,280,700	13,513,000	50,632,800	90,838,229	366,200	68,000	141,905,229
Utah	3,739,454	3,448,349	583,975	7,771,778	17,117,795	50,731		24,940,304
Vermont	2,402,239	1,364,589	196,945	3,963,773	12,652,764	266,885	82,390	16,965,812
Virginia	7,260,996	6,730,929	2,044,311	16,036,236	40,116,902	213,828	68,314	56,435,280
Washington	5,352,250	5,093,580	1,468,176	11,914,006	20,655,821	536,496	164,015	33,270,338
West Virginia	3,849,421	4,814,105	729,825	9,393,351	21,700,557	407,098	127,428	31,628,434
Wisconsin	6,849,108	5,333,207	2,455,726	14,638,041	26,792,582	480,153	163,091	42,073,867
Wyoming	5,544,502	2,472,026	148,333	8,164,861	15,517,140	154,582	14,633	23,851,216
District of Columbia	2,311,739	1,109,050	5,236,490	8,657,279	8,329,956			16,987,235
Puerto Rico	1,908,843	1,213,270	1,427,668	4,549,781				4,549,781
Total	384,579,422	260,402,405	223,769,158	868,750,985	1,701,516,003	15,662,626	6,273,609	2,592,203,223

[1] Funds available for either urban or rural portions of the Federal-aid primary highway system.

Table 10.—Balances of Federal-aid funds available to States for projects not yet programed as of June 30, 1961

State or territory	Primary [1]	Secondary	Urban	Subtotal	Interstate	Total
Alabama	$406,016	$1,789,732	$295,377	$2,491,125	$25,294,022	$27,785,147
Alaska	10,840,773	2,593,556	154,453	13,588,782		13,588,782
Arizona	177,731	61,786	668,782	908,299	18,913,547	19,821,846
Arkansas	1,559,564	4,412,408	2,754,653	8,726,625	14,962,083	23,688,708
California	1,980,262	9,373,600	3,494,308	14,848,170	58,126,192	72,974,362
Colorado	3,864,513	2,769,221	1,801,191	8,434,925	21,290,675	29,725,600
Connecticut	1,732,774	1,564,153	10,536,005	13,832,932	806,588	14,639,520
Delaware	4,165,523	1,451,774	1,108,904	6,726,201	14,487,529	21,213,730
Florida	3,303,444	6,231,472	8,917,637	18,452,553	32,887,402	51,339,955
Georgia	263,284	3,640,187	2,557,657	6,461,128	2,941,867	9,402,995
Hawaii	10,531	2,342,131	2,151,046	4,503,708	5,388,075	9,891,783
Idaho	2,167,358	4,202,150	1,097,964	7,467,472	25,096,990	32,564,462
Illinois	1,577,022	4,601,207	2,579,013	8,757,242	5,290,720	14,047,962
Indiana	1,773,676	5,185,702	778,487	7,737,865	105,648,241	113,386,106
Iowa	345,346	819,997	1,146,025	2,311,368	3,243,701	5,555,069
Kansas	766,997	2,368,556	2,215,477	5,351,030	26,330,939	31,681,969
Kentucky	277,477	400,366	1,898,736	2,576,579	3,560,097	6,136,676
Louisiana	3,183	4,484	21,346	29,013	14,692,350	14,721,363
Maine	579,712	483,376	2,140,826	3,203,914	6,759,535	9,963,449
Maryland	4,590,365	2,416,943	3,019,365	10,026,673	64,945,900	74,972,573
Massachusetts	223,634	1,143,907	132,437	1,499,978	37,922,910	39,422,888
Michigan	1,798,064	5,698,290	8,025,416	15,521,770	9,013	15,530,783
Minnesota	97,103	1,661,012	169,249	1,927,364	5,662,745	7,590,109
Mississippi	899,894	6,081,742	737,057	7,718,693	10,427,117	18,145,810
Missouri	1,233,901	3,197,142	1,179,887	5,610,930	20,918,249	26,529,179
Montana	4,707,112	1,401,650	1,290,393	7,399,155	47,669,609	55,068,764
Nebraska	1,696,713	2,559,507	2,238,910	6,495,130	5,917,205	12,412,335
Nevada	2,460,680	2,627,672	599,944	5,688,296	17,869,018	23,557,314
New Hampshire	1,920,693	582,412	958,276	3,461,381	2,470,110	5,931,491
New Jersey	9,997,074	2,805,974	19,798,267	32,601,315	64,181,571	96,782,886
New Mexico	160,289	419,143	455,037	1,034,469	20,938,706	21,973,175
New York	2,347,321	7,654,830	8,419,407	18,421,558	11,922,970	30,344,528

North Carolina	1,691,508	9,752,609	3,358,497	14,802,614	8,129,007	22,931,621
North Dakota	998,274	696,791	172,034	1,867,099	17,726,856	19,593,955
Ohio	231,558	628,248	1,394,787	2,254,593	7,372,922	9,627,515
Oklahoma	355,105	3,796,130	3,505,380	7,656,615	20,726,819	28,383,434
Oregon	116,852	1,637,942	334,309	2,089,103	4,584,650	6,673,753
Pennsylvania	3,226,676	4,415,024	15,338,695	22,980,395	55,089,636	78,070,031
Rhode Island	905,396	958,903	3,345,963	5,210,262	16,073,606	21,283,868
South Carolina	271,354	4,292,814	480,321	5,044,489	3,131,194	8,175,683
South Dakota	772,054	2,958,480	182,600	3,913,134	958,677	4,871,811
Tennessee	2,269,997	5,825,617	3,659,509	11,755,123	31,970,806	43,725,929
Texas	1,342,982	13,752,802	680,865	15,776,649	54,563,575	70,340,224
Utah		189,093	869,757	1,058,850	5,168,123	6,226,973
Vermont	73,156	653,059	855,429	1,581,644	25,577,613	27,159,257
Virginia	150,464	202,696	3,662,181	4,015,341	103,904,193	107,919,534
Washington	471,062	1,773,907	3,565,871	5,810,840	30,742,303	36,553,143
West Virginia	1,163,072	580,518	1,327,651	3,071,241	8,469,793	11,541,034
Wisconsin	444,605	6,576,584	942,909	7,964,098	22,073,361	30,037,459
Wyoming	1,021,862	433,192	536,712	1,991,766	18,752,325	20,744,091
District of Columbia	2,008,484	2,761,337	429,501	5,199,322	27,045,650	32,244,972
Puerto Rico	2,322,372	4,869,919	650,852	7,843,143		7,843,143
Total	87,764,862	159,301,747	138,635,355	385,701,964	1,158,636,785	1,544,338,749

[1] Funds available for either urban or rural portions of the Federal-aid primary system.

Table 11.—National System of Interstate and Defense Highways: Status of improvement as of June 30, 1961

State	Mileage open to traffic								Mileage of work in progress with Interstate funds			Remaining mileage	Total designated system mileage
	Completed to full or acceptable standards			Improved to standards adequate for present traffic			Toll facilities	Total open to traffic	Under construction	Engineering or right-of-way	Total under way		
	With Interstate funds	With other public funds	Total	With Interstate funds	With other public funds	Total							
Alabama	66.9		66.9	19.4	32.1	51.5		118.4	193.3	144.7	338.0	418.4	874.8
Alaska													
Arizona	218.0	7.5	225.5	79.5	201.8	281.3		506.8	19.0	261.9	280.9	373.3	1,161.0
Arkansas	40.7		40.7		2.8	2.8		43.5	82.3	375.9	458.2	16.1	517.8
California	159.3	24.3	183.6	175.6	223.6	399.2	14.0	596.8	159.7	1,067.0	1,226.7	353.9	2,177.4
Colorado	131.1	4.1	135.2	60.6	34.9	95.5		230.7	81.0	119.7	200.7	516.6	948.0
Connecticut	24.7	71.1	95.8	6.0	17.7	23.7	19.5	139.0	29.3	119.7	149.0	5.4	293.4
Delaware	.6		.6	.6		.6	2.3	3.5	.7	27.2	27.9	9.1	40.5
Florida	44.4	1.5	45.9				42.4	88.3	185.5	79.3	264.8	766.9	1,120.0
Georgia	115.9	17.5	133.4		75.2	75.2		208.6	145.0	116.3	261.3	634.0	1,103.9
Hawaii					5.8	5.8		5.8				42.3	48.1
Idaho	60.9		60.9	44.1	37.3	81.4		142.3	78.6	157.9	236.5	233.3	612.1
Illinois	174.9	20.5	195.4	25.2	133.6	158.8	151.3	505.5	123.6	499.7	623.3	457.7	1,586.5
Indiana	96.0		96.0	7.4	2.8	10.2	156.9	263.1	81.3	349.9	431.2	424.5	1,118.8
Iowa	187.9		187.9	21.5		21.5	3.8	213.2	57.0	199.6	256.6	238.9	708.7
Kansas	156.7		156.7	16.0	33.6	49.6	187.1	393.4	52.5	57.5	110.0	297.7	801.1
Kentucky	22.9		22.9		8.5	8.5	39.6	71.0	124.8	137.1	261.9	363.2	696.1
Louisiana	41.2	3.6	44.8		6.3	6.3		51.1	138.4	173.5	311.9	319.6	682.6
Maine	39.1	1.2	40.3		3.0	3.0	60.3	103.6	22.9	19.5	42.4	166.0	312.0
Maryland	31.2	31.3	62.5	18.0	28.5	46.5	11.3	120.3	31.2	174.3	205.5	27.9	353.7
Massachusetts	43.3	6.0	49.3	.2	27.5	27.7	125.8	202.8	43.9	93.9	137.8	121.8	462.4
Michigan	245.9	126.4	372.3		5.0	5.0	5.0	382.3	227.0	150.2	377.2	320.3	1,079.8
Minnesota	26.6		26.6	50.9	2.3	53.2		79.8	107.9	288.8	396.7	421.6	898.1
Mississippi	14.7		14.7	14.7	13.8	28.5		43.2	220.8	84.7	305.5	329.5	678.2
Missouri	117.9	1.9	119.8	81.1	165.2	246.3	3.2	369.3	122.5	567.5	690.0	45.4	1,104.7
Montana	96.8		96.8					96.8	98.1	380.1	478.2	604.0	1,179.0
Nebraska	27.9		27.9		12.9	12.9	.3	41.1	43.0	219.9	262.9	186.7	490.7
Nevada	50.7		50.7	5.5		5.5		56.2	48.6	158.8	207.4	270.4	534.0

New Hampshire	55.8		55.8	2.0	2.8	4.8	21.6	82.2	11.7	19.2	30.9	100.7	213.8
New Jersey	13.3	9.2	22.5	10.6	14.3	24.9	54.1	101.5	33.0	119.7	152.7	121.7	375.9
New Mexico	198.0		198.0	94.0		94.0		292.0	59.1	44.7	103.8	607.1	1,002.9
New York	104.0	49.4	153.4	16.1	12.7	28.8	504.9	687.1	148.3	156.5	304.8	235.3	1,227.2
North Carolina	211.8		211.8	55.0	52.0	107.0		318.8	100.8	41.8	142.6	307.5	768.9
North Dakota	137.7		137.7	26.1	33.2	59.3		197.0	49.2	31.5	80.7	290.2	567.9
Ohio	326.7	28.5	355.2		37.6	37.6	174.5	567.3	92.8	437.5	530.3	386.3	1,483.9
Oklahoma	86.8		86.8	25.3	24.6	49.9	175.8	312.5	142.6	116.8	259.4	223.7	795.6
Oregon	192.2	25.2	217.4	27.8	195.3	223.1	.8	441.3	94.6	22.5	117.1	173.5	731.9
Pennsylvania	187.7	54.5	242.2		1.7	1.7	362.1	606.0	125.2	336.3	461.5	473.8	1,541.3
Rhode Island	10.7	9.7	20.4	.2	.1	.3		20.7	.7	17.9	18.6	31.6	70.9
South Carolina	162.5		162.5	2.2	7.9	10.1		172.6	154.9	44.6	199.5	307.1	679.2
South Dakota	59.3		59.3	56.5		56.5		115.8	120.8	162.0	282.8	279.0	677.6
Tennessee	15.1	1.7	16.8	.6		.6		17.4	216.4	326.7	543.1	487.1	1,047.6
Texas	604.1	52.4	656.5	83.9	135.7	219.6	29.8	905.9	292.9	1,110.9	1,403.8	714.2	3,023.9
Utah	53.7		53.7	16.1	2.1	18.2		71.9	58.7	188.5	247.2	615.8	934.9
Vermont	23.1		23.1					23.1	37.7	91.8	129.5	171.3	323.9
Virginia	33.3	5.4	38.7	47.2	37.6	84.8	37.3	160.8	179.8	160.2	340.0	552.3	1,053.1
Washington	70.6	8.3	78.9	140.2	54.3	194.5	.3	273.7	47.5	267.8	315.3	135.9	724.9
West Virginia	.3		.3	10.8		10.8	85.9	97.0	52.7	54.2	106.9	180.7	384.6
Wisconsin	106.5		106.5		39.5	39.5		146.0	96.1	210.4	306.5		452.5
Wyoming	99.5		99.5	38.4		38.4		137.9	209.4	58.7	268.1	509.1	915.1
District of Columbia					.5	.5		.5	4.0	7.7	11.7	16.0	28.2
Total	4,988.9	561.2	5,550.1	1,279.3	1,726.1	3,005.4	2,269.9	10,825.4	4,846.8	10,052.5	14,899.3	14,884.4	[1] 40,609.1

[1] The system is limited to 41,000 miles by law. The small balance is held in reserve for adjustments as final locations are selected and projects built.

Table 12.—Interstate System improvements financed with Federal-aid funds: [1] Status of projects as of June 30, 1961, and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$59,683,428	$40,591,385	91.7	$17,527,290	$15,774,561	64.1	$92,588,608	$82,454,888	158.7	$48,224,077	$43,497,006	148.4
Alaska												
Arizona	18,500,000	17,572,102	46.9	12,040,123	10,248,369	17.8	44,285,884	41,892,496	69.0	24,679,527	23,096,185	100.5
Arkansas	26,406,097	23,765,487	54.4	9,957,630	8,961,867	17.8	77,707,249	69,160,775	84.7	9,780,407	8,769,882	25.3
California	20,639,185	18,769,033	6.4	66,569,197	58,531,576	31.9	599,282,858	401,295,738	159.4	184,237,550	106,534,084	60.8
Colorado	4,590,130	4,191,965	19.4	3,759,331	3,426,025	17.0	24,497,978	18,417,860	62.5	15,940,746	14,420,083	85.2
Connecticut	98,000	88,200		2,091,775	1,875,887	.1	99,893,288	89,010,602	29.6	13,292,210	11,755,398	6.6
Delaware	6,648,234	6,025,257	2.9	14,507,201	13,017,843	1.9	18,749,536	15,801,754	.3	3,483,912	3,329,505	.2
Florida	8,382,301	7,544,071	27.1	9,515,496	8,563,942	25.3	67,628,095	60,813,225	99.4	62,110,060	55,522,867	82.3
Georgia	100,749,429	90,669,775	121.4	4,864,670	4,385,594	8.1	140,351,485	124,101,080	138.0	30,595,480	26,479,982	55.8
Hawaii	2,900,000	2,610,000	1.0				4,863,250	4,376,925				
Idaho	13,122,992	12,110,180	33.3	6,699,835	6,185,959	36.3	24,976,669	23,216,832	100.8	15,300,163	13,977,527	54.9
Illinois	63,794,149	57,344,095	31.0	52,833,397	41,151,726	18.3	307,863,257	270,852,111	164.4	97,939,218	86,205,823	44.9
Indiana	24,323,620	21,891,256	24.1	9,147,250	8,232,525	11.8	116,056,617	103,244,717	95.3	60,022,406	51,182,096	83.1
Iowa	10,709,732	9,696,262	20.5	9,972,858	8,983,481	27.6	36,687,801	32,983,649	61.1	35,847,168	32,474,378	79.2
Kansas	5,156,668	4,641,202	22.4	5,652,478	5,067,015	17.6	33,260,366	29,930,995	62.7	26,233,458	23,310,743	92.9
Kentucky	23,522,223	21,169,004	29.3	20,449,041	18,404,131	23.3	100,792,457	89,694,500	105.4	47,477,564	42,633,569	63.4
Louisiana	31,156,195	28,040,575	15.9	25,232,140	22,705,443	29.2	168,719,127	142,939,271	104.8	8,569,875	7,710,561	9.9
Maine	12,890,900	11,635,530	28.7	2,807,200	2,526,480	9.8	16,818,181	15,095,754	21.2	24,506,347	21,858,743	49.6
Maryland	20,754,088	18,274,619	6.8	10,114,602	8,728,906	2.8	76,043,819	66,453,823	30.0	9,606,764	8,615,594	18.4
Massachusetts	20,953,619	18,858,257	2.1	33,985,808	30,407,370	13.2	123,316,420	108,056,551	39.0	61,754,891	54,273,708	31.2
Michigan	812,619	731,358		7,432,353	6,689,118	7.7	254,458,018	224,483,925	227.1	105,073,324	94,207,554	102.1
Minnesota	50,887,181	46,123,560	35.9	16,032,155	14,503,165	60.2	141,911,857	125,874,588	78.7	28,428,778	25,649,882	28.3
Mississippi	25,581,559	23,067,912	82.3	13,298,180	12,023,332	52.0	68,437,345	60,466,555	176.8	27,670,105	24,631,230	83.5
Missouri	35,410,965	31,827,629	27.4	11,538,235	10,413,499	12.3	127,344,171	114,957,063	130.0	29,287,259	24,377,748	69.5
Montana	13,843,231	12,555,747	81.9	11,988,025	10,949,789	34.7	53,354,559	48,860,671	98.7	15,534,064	14,088,413	61.0
Nebraska	20,625,204	18,578,283	91.6	32,452,949	29,247,637	89.4	38,770,926	34,925,199	22.3	15,229,178	13,598,430	26.3
Nevada	10,468,835	9,945,393	31.3	3,779,576	3,595,841	13.7	43,389,264	41,220,121	48.5	305,439	274,175	
New Hampshire	4,608,715	4,147,844	4.5	4,914,273	4,422,688	5.3	22,727,369	19,185,773	12.7	23,522,022	20,909,765	32.7
New Jersey	18,876,840	16,989,156	6.2	36,286,812	32,748,176	10.7	172,108,952	145,177,827	21.4	41,678,219	37,340,563	22.0
New Mexico	11,295,624	10,450,955	19.9	5,742,394	5,152,787	29.2	30,580,866	28,323,744	42.4	11,523,051	10,641,514	42.3
New York	7,262,238	6,536,015	.1	74,318,468	62,253,270	29.2	426,341,027	372,035,253	105.9	109,884,688	84,046,288	59.9

North Carolina	17,114,251	15,401,026	26.7	10,813,835	9,232,140	41.9	43,648,345	39,291,652	138.4	31,361,472	28,021,913	126.6
North Dakota	642,568	593,310	----------	567,800	508,518	----------	18,514,722	16,853,483	81.7	13,705,951	12,310,709	82.8
Ohio	274,500	247,050	----------	40,899,843	34,321,709	22.0	181,605,157	160,614,496	64.9	134,892,107	118,697,446	83.1
Oklahoma	6,300.700	5,487,280	25.5	7,782,200	6,987,865	24.5	37,450,719	33,597,629	84.3	20,577,534	18,462,912	70.7
Oregon	14,418,246	13,057,211	35.1	9,143,676	8,403,500	29.4	96,669,907	86,327,300	157.6	29.378,542	25,053,809	116.3
Pennsylvania	101,249,840	90,537,858	71.0	51,030,697	45,260,111	42.1	130,950,279	117,714,296	53.6	73,927,878	66,499,730	92.9
Rhode Island	1,236,000	1,112,400	----------	116,440	100,935	----------	24,152,407	21,372,845	----------	5,309,756	4,649,053	1.3
South Carolina	7,951,449	7,199,624	7.2	4,083,533	3,676,233	11.7	49,567,974	44,164,901	144.6	45,417,420	40,672,876	142.7
South Dakota	13,416,321	12,217,863	62.0	1,291,085	1,175,662	3.3	46,442,319	42,261,869	152.9	21,114,387	19,239,934	70.7
Tennessee	39,594,837	35,635,336	51.3	10,510,633	9,459,563	28.4	195,890,736	173,168,239	184.4	37,455,100	33,264,917	77.0
Texas	28,935,500	26,020,150	57.1	22,961,250	20,455,325	38.9	248,788,477	201,249,010	240.0	101,367,669	91,028,140	153.4
Utah	14,906,655	14,136,459	25.3	10,052,256	9,280,260	24.5	37,970,700	35,956,526	35.7	19,568,475	18,337,954	64.6
Vermont	645,438	580,894	1.2	3,153,508	2,832,791	4.3	41,404,607	37,135,692	33.4	23,820,013	21,431,738	15.8
Virginia	22,368,950	20,142,355	19.4	11,098,240	9,994,802	22.5	225,931,272	202,615,866	232.0	21,422,872	18,987,412	27.8
Washington	8,084,065	7,329,850	9.6	5,382,629	2,188,570	6.8	73,981,195	65,619,415	38.1	25,678,572	23,098,959	33.0
West Virginia	41,939,907	37,747,366	19.7	15,642,580	14,078,322	26.8	58,438,959	50,905,208	47.6	28,463,754	25,353,378	25.5
Wisconsin	19,278,494	17,474,327	39.1	8,221,612	7,500,015	32.7	61,447,360	54,130,364	117.4	38,952,860	32,617,845	96.3
Wyoming	5,376,996	5,039,504	18.9	7,962,916	7,396,659	43.6	40,294,486	37,428,582	206.3	21,990,117	20,469,266	112.4
District of Columbia	3,766,928	3,390,235	----------	12,316,354	11,042,834	.8	44,990,832	39,873,435	3.6	18,160,463	15,975,481	4.6
Puerto Rico	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------
Total	1,022,155,646	909,792,205	1,435.5	768,541,829	673,073,816	1,125.5	5,211,947,752	4,465,585,073	4,567.3	1,900,302,892	1,619,586,768	3,017.7

[1] Includes projects financed from Federal-aid primary, secondary, urban, and Interstate funds.
[2] Initial commitment of funds.

Table 13.—Improvements on the Federal-aid primary system in rural areas financed with Federal-aid funds: [1] Status of projects as of June 30, 1961, and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$29,760,771	$25,678,364	83.7	$18,058,264	$15,814,476	72.6	$94,294,061	$69,896,766	305.9	$55,927,075	$46,928,318	242.8
Alaska	20,327,264	19,208,235	223.9	5,498,202	5,200,743	63.3	20,096,582	18,136,640	61.7	7,386,689	6,230,713	50.2
Arizona	15,168,858	13,998,585	63.8	11,285,177	9,239,601	30.3	38,847,375	35,538,813	88.6	26,536,649	24,298,412	134.3
Arkansas	33,401,263	25,569,240	187.6	9,190,570	5,916,786	66.3	59,784,311	47,401,539	226.1	12,410,967	8,566,054	76.8
California	8,897,021	6,634,822	7.0	31,350,145	20,968,915	29.6	178,982,391	113,219,514	134.5	76,246,594	55,522,416	96.0
Colorado	9,352,530	6,915,788	89.4	5,786,537	4,150,550	52.9	31,105,209	21,915,819	142.6	25,725,665	19,021,525	198.4
Connecticut				3,276,621	1,465,475	1.5	51,756,621	41,755,192	37.0	14,731,153	8,622,513	13.6
Delaware	7,759,234	6,585,507	4.3	15,017,201	13,272,843	4.6	8,610,979	6,493,626	.7	8,380,365	5,765,484	38.1
Florida	14,678,761	10,291,456	83.8	10,233,214	7,232,344	56.5	35,567,572	29,494,486	132.3	47,226,783	36,684,368	152.5
Georgia	66,665,639	57.196,821	250.3	14,745,726	9,392,742	76.6	113,138,128	87,866,628	284.3	37,180,106	27,275,270	160.6
Hawaii	5,656,000	2,524,500	17.5	26,685	12,475		3,104,842	1,629,119	4.3	1,056,777	480,500	1.7
Idaho	14,115,087	12,558,818	65.4	8,908,986	7,524,197	83.4	30,079,108	25,404,938	154.8	19,682,698	16,746,677	74.1
Illinois	29,936,821	25,937,580	25.6	11,271,780	9,796,742	22.9	207,407,559	162,839,139	369.9	66,559,249	46,388,199	218.6
Indiana	24,622,737	20,527,061	48.5	10,787,685	7,858,894	76.5	116,265,425	88,853,654	254.1	77,515,744	57,797,712	359.0
Iowa	8,782,053	7,722,590	27.6	13,526,473	10,517,407	92.7	50,941,614	36,495,622	413.5	32,766,567	24,291,822	282.5
Kansas	10,481,054	7,139,395	146.0	9,067,932	5,796,268	91.3	26,482,210	18,337,197	286.3	25,396,728	16,533,673	294.1
Kentucky	21,787,665	18,610,025	38.4	21,210,926	17,268,483	36.8	90,370,568	72,229,438	186.9	49,071,170	38,779,101	92.5
Louisiana	7,367,811	6,563,503	8.1	24,454,970	20,083,343	84.8	118,317,284	93,580,632	216.4	18,316,548	8,910,585	50.0
Maine	20,437,100	15,409,230	50.6	4,102,634	3,172,097	16.1	18,302,795	13,854,869	42.5	20,921,541	17,145,541	64.2
Maryland	19,905,088	17,510,519	6.5	6,811,066	3,461,825	25.0	18 399,872	14,336,176	17.8	10,237,748	6,800,283	33.0
Massachusetts	1,697,966	1,378,954		25,980,268	17,879,915	25.1	60,530,183	49,823,796	28.5	33,372,562	24,924,886	35.3
Michigan	4,188,279	2,500,597	3.6	14,331,164	9,193,787	80.5	223,783,768	187,009,426	427.0	113,619,566	93,363,527	346.8
Minnesota	9,769,991	8,807,007	22.5	15,162,410	12,735,956	70.9	78,004,408	53,428,366	572.8	19,876,014	12,468,668	155.9
Mississippi	30,544,967	24,578,022	162.7	15,051,362	12,039,251	96.6	67,915,607	54,036,428	336.5	34,402,784	25,366,790	248.8
Missouri	28,873,479	25,053,372	31.7	14,268,449	11,170,271	45.3	118,465,565	90,832,361	250.4	38,137,445	27,027,345	188.3
Montana	15,372,389	12,785,178	133.4	13,945,038	11,941,909	58.0	64,021,904	53,518,106	318.2	27,199,990	21,255,690	258.6
Nebraska	20,375,574	17,453,348	112.8	36,894,112	27,983,153	305.4	30,164,242	23,342,758	126.3	23,839,175	18,001,819	120.6
Nevada	12,567,834	11,827,750	65.4	3,779,576	3,595,841	13.7	30,919,664	28,172,735	158.1	2,307,355	1,963,704	38.0
New Hampshire	4,520,327	4,043,570	4.5	5,557,527	4,698,017	9.0	22,739,746	17,356,501	28.1	26,891,307	22,351,305	46.1
New Jersey	5,520,280	4,962,132	2.9	6,277,520	4,299,288	8.5	55,956,962	40,218,861	29.1	30,193,863	25,172,169	24.1
New Mexico	9,875,311	8,067,826	40.4	4,502,261	4,016,733	28.5	21,283,351	16,563,631	99.1	10,685,813	8,334,520	64.2
New York	9,848,624	6,258,808	29.4	29,569,430	18,847,814	101.2	149,762,066	105,248,284	209.1	63,068,291	38,319,886	223.0

North Carolina	23,698,247	17,507,285	53.2	14,037,093	10,830,118	100.1	65,590,185	49,678,099	302.0	44,096,249	33,025,706	241.8
North Dakota	2,590,842	1,585,247	43.5	1,300,170	874,703	35.4	28,844,015	21,794,974	289.1	22,483,803	16,900,545	256.3
Ohio	319,800	287,820		31,298,507	23,561,167	40.2	103,025,667	78,226,223	100.3	114,064,269	89,730,854	142.9
Oklahoma	14,355,600	9,492,480	101.0	15,739,608	10,279,823	119.6	43,766,682	29,861,561	250.2	23,811,387	17,775,898	163.0
Oregon	12,609,600	11,298,332	35.1	12,336,283	9,702,500	59.7	56,365,342	48,069,170	181.2	34,682,052	27,244,877	178.0
Pennsylvania	75,149,140	57,000,388	101.7	46,646,616	37,958,208	75.0	105,140,679	77,015,289	91.1	82,521,499	64,354,839	119.7
Rhode Island	3,273,000	1,670,500	14.1				5,085,758	2,784,645	2.4	2,821,846	1,450,832	5.6
South Carolina	16,265,689	10,680,127	76.5	5,669,190	4,239,657	41.3	57,938,532	45,343,274	299.0	48,350,724	40,794,709	196.0
South Dakota	19,642,886	15,662,398	193.6	3,787,132	2,556,471	27.3	42,433,133	36,912,080	295.5	30,764,058	24,202,671	334.8
Tennessee	24,667,003	20,034,904	73.5	10,633,330	6,576,112	90.2	115,769,586	95,489,295	234.2	43,365,874	34,864,627	164.0
Texas	21,437,000	17,002,650	81.0	16,590,525	10,944,500	153.1	129,999,459	97,197,260	745.2	96,679,728	71,284,685	551.4
Utah	8,713,313	7,395,833	57.1	11,446,795	9,404,211	63.6	21,158,030	19,168,301	58.4	17,439,154	15,446,939	92.4
Vermont	3,000	2,700		2,846,815	2,117,895	5.3	40,733,983	33,565,128	53.2	24,656,983	20,118,215	34.1
Virginia	22,753,950	20,342,095	21.2	15,991,210	12,201,996	52.3	212,132,842	179,817,540	319.3	27,393,791	21,052,091	62.8
Washington	11,162,700	6,770,500	27.3	7,246,527	2,758,753	31.8	39,494,631	29,411,449	103.1	18,106,424	12,664,447	98.8
West Virginia	30,417,087	24,034,144	47.8	16,040,980	14,055,922	26.6	59,141,604	47,250,273	79.4	30,884,006	26,705,216	104.7
Wisconsin	12,103,039	10,139,180	53.7	13,296,962	9,095,765	96.1	51,731,053	39,984,821	222.1	33,605,208	24,151,228	230.6
Wyoming	5,013,536	4,647,018	18.6	9,834,756	8,504,487	56.1	51,085,359	44,276,288	274.2	27,894,238	24,077,995	195.1
District of Columbia	625,000	312,500	.6				888,006	740,569				
Puerto Rico	8,177,812	4,038,906	16.4				9,345,420	4,618,989	20.2	458,441	212,926	3.1
Total	835,236,022	674,203,610	3,053.2	654,672,410	492,210,429	2,900.1	3,475,071,938	2,700,036,288	9,863.5	1,780,960,715	1,357,398,775	7,557.8

[1] Includes projects on rural portions of the Federal-aid primary highway system financed from Federal-aid primary, secondary, D, and Interstate funds. [2] Initial commitment of funds.

Table 14.—Improvements on secondary roads in rural areas financed with Federal-aid funds: [1] Status of projects as of June 30, 1961, and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$6,900	$6,210		$5,964,400	$2,843,246	183.4	$16,399,481	$7,816,913	455.4	$10,964,884	$5,447,983	410.6
Alaska	15,178,077	14,354,000	150.0	5,283,102	4,914,921	32.5	15,461,480	13,170,400	96.5	7,481,818	6,153,007	77.8
Arizona	40,000	36,000		1,438,778	1,118,941	13.7	7,546,502	5,515,990	111.9	5,429,488	3,884,631	69.3
Arkansas	853,654	426,814	49.6	4,125,960	2,086,020	100.0	15,198,954	7,358,029	356.3	7,574,532	3,777,074	294.1
California	238,976	143,051		6,940,000	3,873,300	49.6	12,154,782	6,970,645	93.7	22,182,380	11,868,157	254.0
Colorado				3,326,450	2,292,368	80.3	8,085,606	4,319,852	154.4	8,802,828	5,141,735	191.6
Connecticut							5,441,481	2,740,549	21.7	4,000,973	2,037,921	10.1
Delaware				1,600,000	800,000	4.4	271,982	149,191		2,138,579	1,056,407	23.9
Florida	2,571,544	1,285,772	65.7				6,716,278	3,363,223	77.1	7,740,823	3,924,069	122.8
Georgia	603,780	407,540	6.7	6,773,580	3,363,666	105.8	31,076,269	15,230,221	594.5	9,461,242	4,723,304	201.5
Hawaii	475,950	237,100	.2	467,758	274,298	2.1	460,409	226,469	.1	4,476,415	2,223,002	10.5
Idaho	310,315	211,776	5.6	2,623,301	1,838,286	46.0	5,130,261	3,027,339	96.7	4,521,580	2,832,343	122.8
Illinois	2,148,388	1,074,194	27.8	4,726,600	2,363,300	59.2	31,264,780	15,575,850	486.6	19,556,212	9,555,856	445.9
Indiana	10,403,780	5,236,440	57.4	2,311,050	1,175,725	13.3	14,128,645	7,121,481	119.9	15,094,916	7,547,366	152.9
Iowa	21,716	10,858		1,316,020	679,610	47.7	17,734,775	8,958,803	721.8	10,372,226	5,233,437	381.5
Kansas	1,230,898	615,449	63.1	2,266,800	1,149,280	121.5	17,051,602	8,519,480	933.4	14,949,264	7,517,274	885.6
Kentucky	218,150	113,875		4,865,401	2,441,201	73.0	22,846,377	11,866,184	133.5	10,532,585	4,724,700	110.6
Louisiana	122,168	61,084		889,000	448,100	7.3	19,421,743	9,742,009	286.7	13,895,490	6,569,771	176.2
Maine	1,868,950	934,475	12.6	1,940,667	970,334	16.0	5,871,110	2,574,627	44.7	2,657,207	1,325,509	25.7
Maryland				3,037,800	1,580,150	74.6	3,415,951	1,829,613	103.4	2,732,997	1,338,199	89.7
Massachusetts	221,752	110,876	1.9	1,265,600	631,550	3.3	5,380,714	2,931,867	17.3	4,050,080	2,220,865	4.2
Michigan	686,488	347,244	25.3	9,749,700	4,920,450	357.9	18,725,591	9,423,130	460.1	13,342,128	6,486,456	421.2
Minnesota	66,269	38,095		871,500	421,340	57.7	21,415,520	10,817,873	1,086.0	13,744,893	6,995,141	900.8
Mississippi	475,100	237,550		2,337,620	1,034,170	98.4	13,730,460	6,229,464	396.6	11,039,391	5,147,580	452.4
Missouri	2,765,824	1,382,912	192.4	2,326,140	1,163,070	145.9	18,637,630	9,374,110	881.1	16,345,584	7,637,121	832.7
Montana	21,700	18,626		6,206,700	3,883,041	132.3	13,711,844	8,236,508	190.9	8,643,379	5,480,328	195.9
Nebraska	884,394	457,197	16.0	4,918,002	2,473,981	156.0	22,662,209	11,493,676	785.2	4,124,392	2,134,304	151.1
Nevada	52,541	47,250		3,656,000	3,290,068	61.7	2,270,766	1,990,538	28.3	1,419,582	1,194,117	38.1
New Hampshire	541,208	270,604	2.0	842,000	473,500	5.0	3,578,336	1,763,987	18.2	2,940,255	1,449,570	13.8
New Jersey	1,324,000	662,000	11.4	370,000	185,000	11.3	3,293,602	1,641,842	16.6	1,963,324	950,151	12.4
New Mexico	973,307	649,262	10.6	16,000	14,400		6,950,609	4,803,442	106.3	8,408,144	5,352,111	129.9
New York	1,740,928	870,464	3.8	2,496,322	1,257,289	21.3	26,078,411	11,892,898	142.1	17,833,176	8,390,254	130.0

North Carolina	3,641,708	1,820,854	11.3	3,926,120	2,021,160	126.5	18,984,458	8,271,428	268.6	11,631,444	5,844,029	352.4
North Dakota	685,462	342,731	104.5	929,730	482,129	92.0	9,762,692	4,911,612	607.4	12,937,967	6,379,663	1,051.8
Ohio				12,791,756	6,780,587	56.2	40,462,052	21,776,502	204.4	7,489,688	4,224,506	33.6
Oklahoma	631,400	315,700	42.5	4,388,978	2,360,788	159.7	12,897,305	6,466,520	396.1	13,715,869	6,870,939	452.7
Oregon	416,000	250,119	4.0	1,522,256	916,200	73.0	8,499,092	5,175,817	115.3	8,929,940	5,496,675	170.2
Pennsylvania	2,640,000	1,320,000	14.6	11,895,200	5,943,600	55.3	26,436,066	13,232,047	138.8	7,641,124	3,791,585	47.7
Rhode Island				550,000	275,000	1.9	1,163,459	571,762	3.8	395,724	189,862	1.5
South Carolina	1,315,040	732,720	71.9	2,368,800	1,192,320	151.2	14,052,166	6,809,384	709.5	10,832,391	5,437,918	636.8
South Dakota	444,551	246,470	15.6	2,460,262	1,473,406	114.7	6,225,021	3,450,961	384.9	8,446,730	4,929,152	421.5
Tennessee	3,525,230	1,762,615	67.8	5,432,304	2,737,873	206.6	14,364,676	7,197,190	448.2	12,327,617	6,188,708	551.3
Texas	175,800	87,900	5.4	5,104,800	2,577,550	115.8	34,137,770	17,345,900	769.3	29,738,085	14,901,400	945.1
Utah				1,306,000	1,015.531	20.9	6,640,185	4,873,356	100.4	3,314,363	2,303,322	64.7
Vermont	394,000	197,000	4.9	139,900	69,950	2.0	3,427,223	1,717,553	30.0	2,400,980	1,189,366	25.6
Virginia				3,222,395	1,752,236	44.8	18,407,653	9,519,531	215.1	11,337,609	5,841,392	272.6
Washington	431,600	242,800	36.1	4,784,520	2,469,528	44.1	12,377,758	6,418,794	262.6	8,188,240	4,371,289	246.2
West Virginia	2,622,320	1,311,160	29.5	12,750,894	6,590,872	63.8	12,785,696	6,306,924	60.9	10,055,218	5,034,278	317.4
Wisconsin	364,319	182,159	2.0	2,386,054	1,173,635	35.0	12,770,896	6,379,534	350.5	14,746,330	7,444,136	461.9
Wyoming	71,021	47,122		1,773,000	1,176,385	30.1	7,987,285	5,253,744	142.7	3,612,283	2,387,180	81.3
District of Columbia							98,737	49,369				
Puerto Rico	683,404	337,752	3.7	415,726	202,576	2.7	9,013,662	4,262,540	47.1	810,340	382,573	3.5
Total	64,088,612	39,443,820	1,115.9	173,100,946	95,171,931	3,477.5	682,608,012	356,666,671	14,272.6	466,972,709	243,527,716	13,477.4

[1] Includes projects on secondary roads in rural areas financed from Federal-aid secondary and D funds. [2] Initial commitment of funds.

Table 15.—Improvements in urban areas financed with Federal-aid funds:[1] Status of projects as of June 30, 1961, and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$30,883,771	$15,488,718	10.2	$2,350,057	$1,385,263	5.9	$53,988,547	$39,479,353	60.5	$9,340,612	$5,101,933	34.6
Alaska	34	32					1,272,284	1,129,042	.3	1,863,460	1,629,364	4.2
Arizona	8,427,000	7,458,956	11.8	2,713,546	2,426,306	3.1	13,248,291	12,098,801	12.0	8,406,517	7,056,742	17.9
Arkansas	6,768,229	5,388,386	18.2	7,954,510	6,922,841	7.7	45,352,549	35,939,598	30.3	6,814,049	5,212,528	18.3
California	35,417,428	24,709,195	19.0	60,409,748	50,343,161	27.1	562,545,304	367,018,576	120.6	166,722,321	82,052,078	31.8
Colorado	1,535,000	879,555	2.0	1,246,504	1,131,062	1.0	13,411,418	7,466,985	6.7	5,755,035	3,930,549	16.9
Connecticut	98,000	88,200		1,670,037	1,477,320	.1	77,131,908	61,287,936	18.5	23,547,376	14,581,168	14.7
Delaware	600,000	300,000	3.2	525,400	251,000	.8	10,903,639	9,690,669	.1	1,245,806	684,078	9.6
Florida	5,685,540	3,243,615	17.7	5,204,250	4,339,659	6.6	40,193,658	35,419,712	10.1	49,627,521	36,323,126	19.4
Georgia	52,407,462	42,967,990	62.2	7,000,261	3,565,510	19.7	80,136,767	62,750,458	52.7	24,128,751	14,835,140	46.8
Hawaii	4,042,870	3,181,435	2.3	1,726	815		8,224,729	5,835,168	.7	2,479,572	1,156,287	1.2
Idaho	1,596,949	1,351,413	2.6	202,796	180,437	6.0	6,030,414	5,141,602	8.7	2,354,759	1,614,173	3.2
Illinois	42,744,900	36,216,891	16.9	59,454,602	44,517,005	16.1	210,434,895	163,931,858	73.6	86,718,935	67,453,799	41.6
Indiana	11,896,008	7,505,997	9.9	4,533,008	3,547,143	7.8	65,926,054	48,598,199	36.9	21,862,775	13,074,749	21.6
Iowa	4,674,499	3,567,282	9.2	3,159,207	2,060,998	7.9	14,360,498	10,921,457	17.8	19,992,134	16,966,517	54.6
Kansas	2,384,010	1,387,655	12.6	3,265,296	2,626,965	6.3	22,777,781	19,696,724	22.3	19,545,034	16,052,088	37.5
Kentucky	8,455,729	6,123,544	5.2	6,656,873	4,934,615	5.7	43,211,079	34,837,301	21.1	15,910,695	12,992,322	10.7
Louisiana	24,104,280	21,655,820	7.8	9,423,410	7,610,220	7.9	91,365,372	69,840,781	32.5	11,944,558	7,636,295	18.6
Maine	826,440	415,260	2.4				8,998,010	6,732,723	7.4	7,701,976	6,872,796	6.0
Maryland	5,671,300	3,169,100	9.2	13,882,267	10,758,258	10.8	78,761,013	62,805,618	52.9	12,424,231	8,494,364	14.7
Massachusetts	20,735,650	18,202,957	2.1	12,318,357	29,128,944	24.7	119,676,606	86,778,022	42.1	67,919,288	48,650,708	28.9
Michigan	2,025,373	1,050,127	1.7	17,945,845	9,581,936	6.6	115,769,384	79,925,964	29.4	25,419,084	17,334,215	16.5
Minnesota	41,243,268	37,383,593	13.4	5,796,377	4,372,842	3.1	128,995,547	107,006,631	70.2	30,839,560	25,262,240	27.0
Mississippi	5,293,257	3,941,339	13.1	3,288,954	2,721,269	10.8	25,118,462	18,838,340	32.1	9,126,734	6,880,128	28.8
Missouri	12,810,615	10,013,987	7.9	8,603,621	5,001,299	6.5	68,037,035	53,985,895	29.7	16,909,314	10,581,391	24.9
Montana	2,471,150	2,158,748	10.8	2,519,120	1,686,934	4.1	8,898,276	6,937,510	19.2	1,767,444	1,071,394	7.7
Nebraska	2,680,482	2,346,161	2.3	13,541,489	11,314,071	10.0	20,282,510	17,571,298	2.7	2,314,502	1,398,062	2.8
Nevada	69,821	62,789	.4	27,060	24,335		25,940,277	24,642,233	1.3	669,710	561,617	
New Hampshire	437,756	278,958	.3	115,745	104,171		5,250,907	4,445,809	2.4	1,680,887	1,045,037	3.4
New Jersey	19,785,820	15,241,604	12.1	38,581,267	32,734,876	12.9	173,577,217	133,627,395	31.5	28,995,790	20,887,117	20.3
New Mexico	6,134,695	5,506,657	6.5	2,027,813	1,640,518	2.5	23,650,371	20,323,362	12.6	6,546,896	5,808,783	7.4
New York	24,626,096	14,736,380	7.9	93,323,156	66,713,677	32.7	502,646,869	374,089,143	134.6	133,260,539	87,775,328	81.7

North Carolina	9,976,952	6,252,215	25.2	1,966,032	998,117	5.1	9,809,909	5,638,057	17.7	7,368,777	5,076,411	19.6
North Dakota	87,048	43,524	----------	----------	----------	----------	2,621,576	1,576,418	10.0	800,043	400,022	3.1
Ohio	182,300	164,070	----------	38,410,039	26,314,517	26.0	173,624,969	133,987,605	48.6	75,850,412	58,516,373	25.2
Oklahoma	3,540,678	1,811,201	17.7	3,044,575	2,212,650	4.6	21,802,739	18,011,916	13.6	10,612,093	7,576,028	22.9
Oregon	6,237,646	3,059,672	1.9	2,479,298	2,178,300	1.1	61,844,967	51,496,507	22.5	7,116,188	5,482,984	6.8
Pennsylvania	94,956,253	67,671,497	45.6	15,933,581	13,016,653	7.6	109,236,287	81,792,302	48.6	55,510,431	33,739,684	33.7
Rhode Island	1,830,000	1,375,400	.7	566,440	325,935	1.5	32,321,379	25,199,083	8.8	13,305,144	8,460,575	15.0
South Carolina	5,632,991	3,662,722	24.9	2,014,444	1,299,680	7.1	17,061,275	11,948,553	27.2	6,162,615	4,482,723	5.9
South Dakota	2,328,464	1,288,104	7.3	----------	----------	----------	10,546,028	8,966,243	17.5	4,819,594	3,050,984	12.2
Tennessee	23,720,354	20,000,692	12.4	11,421,239	8,650,419	17.8	116,803,395	95,219,700	36.6	10,459,302	6,587,070	11.1
Texas	13,728,500	12,251,300	10.4	30,526,693	22,298,625	38.4	196,090,073	145,518,850	131.3	76,422,836	56,451,398	123.6
Utah	11,993,342	11,095,351	17.7	4,963,416	4,700,684	1.7	22,629,088	21,089,053	3.5	7,929,710	7,152,465	13.0
Vermont	642,438	578,194	1.2	1,417,288	1,270,193	1.4	8,397,822	7,435,656	4.3	5,412,554	4,427,493	4.4
Virginia	4,375,820	2,202,310	6.1	3,499,258	2,035,579	6.6	51,699,384	42,521,934	18.2	5,912,812	4,006,513	8.2
Washington	5,465,165	3,949,050	5.5	1,392,197	1,178,736	1.7	62,109,953	50,707,479	15.1	19,935,100	17,289,983	26.9
West Virginia	26,635,697	21,277,460	8.1	1,165,349	804,274	2.1	24,080,206	16,046,716	6.7	1,354,150	710,198	2.1
Wisconsin	12,226,268	9,877,755	4.2	9,257,314	5,634,135	8.4	44,864,020	31,208,899	22.5	27,775,196	19,795,502	20.6
Wyoming	613,971	563,902	3.4	958,192	828,616	3.5	1,523,549	1,252,535	4.1	2,241,494	1,813,218	6.8
District of Columbia	7,162,128	5,087,835	3.5	16,526,049	13,331,684	2.4	74,900,635	55,292,447	10.4	25,190,117	19,256,245	11.3
Puerto Rico	6,673,418	3,336,709	1.7	792,453	345,556	1.4	11,303,074	5,450,817	8.0	5,231,712	2,369,436	1.7
Total	624,542,895	471,571,307	498.4	564,076,159	420,557,803	392.8	3,719,387,999	2,799,154,936	1,468.7	1,193,246,145	817,621,421	1,047.4

[1] Includes projects in urban areas financed from Federal-aid primary, secondary, urban, "D" and Interstate funds. [2] Initial commitment of funds.

Table 16.—Funds authorized by secs. 2(a) and 2(e) (D and L funds, respectively) of the 1958 act: Projects completed during the fiscal year ended June 30, 1961, by State

State or territory	Completed during fiscal year			
	Total cost	Federal funds		Miles
		D funds	L funds	
Alabama	$831,885	$593,326	$66,010	8.7
Alaska	2,817,841	2,099,257	120,516	18.5
California	41,182	28,476	6,823	.3
Georgia	444,755	284,895	94,965	7.8
Idaho	301,909	218,860	29,384	9.7
Indiana	477,869	318,580	106,193	.3
Kentucky	2,519,924	1,672,785	557,595	8.3
Massachusetts	1,753,999	723,501	344,995	4.5
Minnesota	2,825,048	1,654,478	13,021	33.4
Montana	598,654	425,164	115,660	9.4
New York	8,467,976	5,396,718	1,626,994	31.7
North Dakota	166,596	91,120	6,000	10.4
Ohio	1,790,872	1,192,661	368,902	7.3
Oregon	25,713	19,049	4,323	.6
South Carolina	1,267,843	578,400		50.2
Washington	852,114	588,129	175,961	2.9
West Virginia	223,000	148,667	41,055	.7
Wisconsin	485,707	279,920	93,306	7.8
Total	25,892,887	16,313,986	3,771,703	212.5

Table 21.—Mileage of highway construction in national monuments, parks, and parkways under the direct supervision of the Bureau of Public Roads during fiscal year 1961

Monument, park, or parkway (and State)	Completed during fiscal year	Under construction as of June 30, 1961
MONUMENTS:		
Arches (Utah)	2.8	
Capitol Reef (Utah)		5.7
Petrified Forest (Ariz.)	5.8	
PARKS:		
Bryce Canyon (Utah)		3.8
Carlsbad Caverns (N. Mex.)		6.3
Crater Lake (Oregon.)		6.2
Glacier (Mont.)		20.1
Grand Canyon (Ariz.)	19.7	11.9
Grand Teton (Wyo.)	5.4	
Great Smoky Mountains (N.C.-Tenn.)	19.0	14.0
Hawaii (Hawaii)		4.8
Mammoth Cave (Ky.)	0.5	14.7
Mt. McKinley (Alaska)	0.6	34.8
Mt. Rainier (Wash.)		3.9
Olympic (Wash.)		6.3
Rocky Mountain (Colo.)	1.5	
Sequoia-Kings Canyon (Calif.)		15.9
Shenandoah (Va.)		0.4
Theodore Roosevelt Memorial (N. Dak.)		6.9
Vicksburg Military (Miss.)		4.2
Yellowstone (Wyo.)	4.5	19.5
Yosemite (Calif.)	8.7	20.1
PARKWAYS:		
Blue Ridge (Va.-N.C.)	45.8	39.8
Colonial (Va.)	1.8	
Foothills (Tenn.)	0.1	15.6
George Washington Memorial (Md.-Va.)	3.9	8.9
Natchez Trace (Ala.-Miss.-Tenn.)	57.7	79.9
Total	177.8	343.7

Table 17.—Program authorized by secs. 2(a) and 2(e) (D and L funds, respectively) of 1958 act as of June 30, 1961, by program and by State

State or territory	Primary			Secondary			Urban			Total			
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds		Miles
											D funds	L funds	
Alabama	$9,064,149	$7,927,121	178.2	$2,516,073	$2,132,064	73.9	$530,838	$464,320	8.9	$12,111,060	$8,026,931	$2,496,574	261.0
Alaska	3,317,213	2,182,108	57.2	3,878,230	3,429,833	66.7	1,053,869	948,482	3.2	8,249,312	6,178,599	381,824	127.1
Arizona	1,510,750	1,357,265	11.5	4,008,620	3,662,954	63.1	473,213	427,546	2.2	5,992,583	4,767,326	680,439	76.8
Arkansas	3,542,153	3,042,387	141.3	5,512,383	4,575,361	202.2	92,794	79,803	3.2	9,147,330	5,880,738	1,816,813	346.7
California	21,912,323	16,384,362	64.1	8,590,299	5,559,720	129.9	7,012,051	5,418,443	7.7	37,514,673	22,073,488	5,289,037	201.7
Colorado	7,690,927	6,347,929	165.9	1,137,955	901,843	24.8	733,672	585,501	5.0	9,562,554	6,259,199	1,576,074	195.7
Connecticut	4,412,758	3,545,237	28.6	1,496,251	1,244,964	7.1	138,895	96,693	.7	6,047,904	3,733,466	1,153,428	36.4
Delaware	1,448,781	1,259,140	14.9	1,308,691	974,290	7.4				2,757,472	1,706,285	527,145	22.3
Florida	7,718,477	6,785,593	122.7	2,095,159	1,729,989	182.0	57,059	50,719	2.6	9,870,695	6,544,442	2,021,859	307.3
Georgia	8,711,117	7,664,869	209.0	2,966,813	2,601,429	69.7	539,131	469,788	12.0	12,217,061	8,054,315	2,684,771	290.7
Hawaii	2,849,494	2,406,145	13.2							2,849,494	1,838,235	567,910	13.2
Idaho	1,343,024	1,148,190	42.3	4,112,633	3,628,085	123.6				5,455,657	3,936,209	840,066	165.9
Illinois	18,134,050	15,986,349	358.0	8,157,899	5,615,793	206.0	1,138,235	1,008,591	3.6	27,430,184	17,893,047	4,807,689	567.6
Indiana	12,215,479	10,858,113	194.7	1,847,782	1,377,337	55.7				14,063,261	9,375,435	2,860,015	250.4
Iowa	7,976,015	6,617,979	145.5	4,891,992	3,931,251	253.1	689,418	606,952	3.2	13,557,425	8,523,047	2,633,135	401.8
Kansas	6,486,155	5,659,444	136.2	4,890,081	4,133,061	342.7	1,051,619	840,430	3.4	12,337,855	8,123,299	2,509,636	482.3
Kentucky	5,084,987	4,217,513	22.8	6,052,209	5,126,892	93.2				11,137,196	7,138,825	2,205,490	116.0
Louisiana	3,040,623	2,689,498	50.2	6,693,536	5,466,640	149.7				9,734,159	6,305,387	1,850,751	199.9
Maine	4,116,448	3,436,891	50.7	546,398	458,220	4.7				4,662,846	2,975,768	919,343	55.4
Maryland	6,443,959	5,420,625	24.7				331,435	331,435		6,775,394	4,394,431	1,357,629	24.7
Massachusetts	9,614,673	7,594,096	29.5	302,686	258,413	.6	2,139,082	1,856,775	3.2	12,086,441	7,417,652	2,291,632	33.3
Michigan	9,626,344	5,918,152	131.7	6,465,116	4,334,565	223.7	5,856,788	3,770,848	20.4	21,948,248	13,857,433	196,132	375.8
Minnesota	7,269,983	4,574,131	127.0	6,013,649	3,651,293	363.6	2,724,675	1,712,271	7.1	16,008,307	9,544,381	393,314	497.7
Mississippi				10,529,823	6,392,195	296.1				10,529,823	6,374,195	18,000	296.1
Missouri	11,466,058	9,786,530	110.2	5,249,699	4,665,628	298.7				16,715,757	11,041,091	3,411,067	408.9
Montana	5,858,098	5,036,564	145.6	3,333,206	2,883,759	121.7				9,191,304	6,325,284	1,595,039	267.3
Nebraska	6,777,076	5,792,147	135.3	3,291,806	2,884,465	76.8				10,068,882	6,628,717	2,047,895	212.1
Nevada	3,610,469	3,424,208	76.0	650,846	601,457	31.3				4,261,315	3,737,178	288,487	107.3

New Hampshire	1,502,268	911,993	9.4	978,247	652,164	.8	353,258	233,723	3.3	2,833,773	1,797,880		13.5
New Jersey	8,211,467	7,255,292	24.7	951,730	628,260	3.6	2,236,602	1,988,092	11.3	11,399,799	7,585,212	2,286,432	39.6
New Mexico	1,941,981	1,747,555	23.3	4,932,716	4,429,258	83.5				6,874,697	5,129,291	1,047,522	106.8
New York	24,322,318	19,426,785	160.3	7,708,589	5,970,027	45.5	10,604,497	8,059,474	11.6	42,635,404	25,765,119	7,691,167	217.4
North Carolina	11,522,218	10,075,857	303.0	2,278,554	1,956,226	35.3	616,413	448,075	3.3	14,417,185	9,527,160	2,952,998	341.6
North Dakota	2,377,088	2,104,833	123.1	4,506,985	3,800,165	269.8				6,884,073	4,511,272	1,393,726	392.9
Ohio	9,732,350	8,279,467	398.3	12,030,291	9,896,261	265.3	3,163,602	2,605,547	60.4	24,926,243	15,876,379	4,904,896	724.0
Oklahoma	6,050,836	4,976,722	57.6	3,419,935	2,951,964	116.7	2,436,991	2,108,368	6.4	11,907,762	7,668,061	2,368,993	180.7
Oregon	3,671,847	3,275,297	30.9	3,049,924	2,588,372	88.5	1,576,214	1,276,444	5.5	8,297,985	5,898,916	1,241,197	124.9
Pennsylvania	21,647,040	18,552,784	99.4	6,982,840	6,113,163	38.6	700,052	488,113	1.1	29,329,932	19,217,078	5,936,982	139.1
Rhode Island	2,066,824	1,764,459	43.0	1,409,133	1,131,204	6.8				3,475,957	2,219,044	676,619	49.8
South Carolina	4,991,075	3,029,191	129.3	3,306,662	1,805,319	151.2	461,671	232,362	3.0	8,759,408	5,066,872		283.5
South Dakota	4,449,072	3,927,209	182.7	2,617,058	1,970,850	220.0				7,066,130	4,880,326	1,017,733	402.7
Tennessee	7,789,801	6,599,258	122.1	4,462,989	3,966,769	176.1	329,139	292,566	8.1	12,581,929	8,295,696	2,562,897	306.3
Texas	25,180,207	21,255,692	670.1	10,469,171	8,110,100	345.2	2,877,852	2,487,100	12.1	38,527,230	24,334,820	7,518,072	1,027.4
Utah	3,559,455	2,789,299	48.6	748,866	582,105	19.4	461,834	358,373	4.5	4,770,155	3,729,777		72.5
Vermont	2,092,851	1,748,734	15.6	502,016	419,682	6.8				2,594,867	1,656,616	511,800	22.4
Virginia	5,071,840	3,904,349	197.7	7,383,799	5,816,329	265.1	454,695	303,128	2.5	12,910,334	7,657,939	2,365,867	465.3
Washington	6,023,208	5,246,617	116.3	3,729,101	2,877,833	152.1	37,647	32,377	1.3	9,789,956	6,494,384	1,662,443	269.7
West Virginia	925,766	810,217	23.8	5,424,337	4,466,783	128.1	626,000	383,475	.6	6,976,103	4,324,463	1,336,012	152.5
Wisconsin	7,664,289	5,598,038	170.7	5,899,961	4,625,267	144.1	2,092,328	1,686,038	4.8	15,656,578	9,098,443	2,810,900	319.6
Wyoming	5,153,630	4,635,262	97.0							5,153,630	3,886,714	748,548	97.0
District of Columbia	2,484,347	2,108,481	3.2	1,214,977	992,357	3.2				3,699,324	2,368,963	731,875	6.4
Puerto Rico	1,542,696	1,318,233	7.4				2,870,585	2,344,973	6.7	4,413,281	2,798,766	864,440	14.1
Total	361,246,057	298,434,210	5,844.5	200,457,716	157,974,869	6,033.7	56,462,154	43,996,828	232.9	618,165,927	398,353,594	102,052,313	12,111.1

Table 18.—Mileage of designated Federal-aid highway systems, by State, as of Dec. 31, 1960

State or territory	National System of Interstate and Defense Highways (Included with primary mileage)			Federal-aid primary highway system (Includes Interstate mileage)			Federal-aidsecondary highway system			Grand total		
	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total
Alabama	777	97	874	5,647	719	6,366	21,728	459	22,187	27,375	1,178	28,553
Alaska				[1] 2,187	15	2,202	3,156	18	3,174	[1] 5,343	33	5,376
Arizona	1,119	42	1,161	2,684	85	2,769	3,755	297	4,052	6,439	382	6,821
Arkansas	477	41	518	3,692	254	3,946	14,284	210	14,494	17,976	464	18,440
California	1,629	553	2,182	7,967	1,469	9,436	11,061	877	11,938	19,028	2,346	21,374
Colorado	891	57	948	4,301	201	4,502	3,998	69	4,067	8,299	270	8,569
Connecticut	157	140	297	874	395	1,269	992	158	1,150	1,866	553	2,419
Delaware	36	4	40	537	48	585	1,400	16	1,416	1,937	64	2,001
Florida	1,012	108	1,120	4,765	605	5,370	12,675	445	13,120	17,440	1,050	18,490
Georgia	967	142	1,109	8,098	725	8,823	19,309	367	19,676	27,407	1,092	28,499
Hawaii	38	10	48	521	47	568	645	10	655	1,166	57	1,223
Idaho	593	19	612	3,131	85	3,216	5,271	46	5,317	8,402	131	8,533
Illinois	1,356	231	1,587	9,579	1,249	10,828	13,640	281	13,921	23,219	1,530	24,749
Indiana	985	134	1,119	5,206	793	5,999	16,381	256	16,637	21,587	1,049	22,636
Iowa	656	53	709	9,672	568	10,240	32,865	246	33,111	42,537	814	43,351
Kansas	687	114	801	7,347	442	7,789	23,404	162	23,566	30,751	604	31,355
Kentucky	637	59	696	4,225	325	4,550	15,062	174	15,236	19,287	499	19,786
Louisiana	590	93	683	2,933	381	3,314	7,555	170	7,725	10,488	551	11,039
Maine	292	20	312	1,788	141	1,929	2,240	60	2,300	4,028	201	4,229
Maryland	217	137	354	1,864	452	2,316	6,754	370	7,124	8,618	822	9,440
Massachusetts	281	181	462	1,518	822	2,340	1,666	555	2,221	3,184	1,377	4,561
Michigan	931	149	1,080	6,836	770	7,606	24,684	291	24,975	31,520	1,061	32,581
Minnesota	772	126	898	8,184	649	8,833	30,138	228	30,366	38,322	877	39,199
Mississippi	615	63	678	5,604	237	5,841	13,539	196	13,735	19,143	433	19,576
Missouri	980	125	1,105	8,747	547	9,294	23,036	115	23,151	31,783	662	32,445
Montana	1,165	14	1,179	6,133	103	6,236	5,209	23	5,232	11,342	126	11,468
Nebraska	480	9	489	5,684	165	5,849	17,475	43	17,518	23,159	208	23,367
Nevada	524	10	534	2,160	34	2,194	2,775	15	2,790	4,935	49	4,984
New Hampshire	196	18	214	1,116	118	1,234	1,620	54	1,674	2,736	172	2,908
New Jersey	212	159	371	1,310	809	2,119	1,601	551	2,152	2,911	1,360	4,271
New Mexico	976	27	1,003	3,828	202	4,030	5,498	57	5,555	9,326	259	9,585
New York	811	416	1,227	8,332	2,248	10,580	17,714	1,577	19,291	26,046	3,825	29,871

North Carolina	731	38	769	6,545	497	7,042	25,234	430	25,664	31,779	927	32,706
North Dakota	556	12	568	4,453	70	4,523	13,187	19	13,206	17,640	89	17,729
Ohio	1,262	222	1,484	7,622	1,148	8,770	17,412	631	18,043	25,034	1,779	26,813
Oklahoma	720	76	796	7,800	442	8,242	12,653	251	12,904	20,453	693	21,146
Oregon	681	51	732	3,766	252	4,018	7,500	106	7,606	11,266	358	11,624
Pennsylvania	1,282	259	1,541	7,142	1,393	8,535	12,257	1,160	13,417	19,399	2,553	21,952
Rhode Island	33	38	71	269	233	502	321	153	474	590	386	976
South Carolina	662	17	679	5,090	365	5,455	16,720	192	16,912	21,810	557	22,367
South Dakota	669	9	678	5,949	90	6,039	12,459	22	12,481	18,408	112	18,520
Tennessee	926	122	1,048	5,350	388	5,738	10,917	58	10,975	16,267	446	16,713
Texas	2,503	520	3,023	15,400	1,945	17,345	31,241	641	31,882	46,641	2,586	49,227
Utah	889	45	934	2,292	92	2,384	3,693	67	3,760	5,985	159	6,144
Vermont	312	12	324	1,513	81	1,594	1,814	23	1,837	3,327	104	3,431
Virginia	952	101	1,053	5,141	505	5,646	18,307	209	18,516	23,448	714	24,162
Washington	596	129	725	3,683	332	4,015	10,772	254	11,026	14,455	586	15,041
West Virginia	352	33	385	2,556	223	2,779	10,631	98	10,729	13,187	321	13,508
Wisconsin	425	27	452	5,860	502	6,362	18,010	839	18,849	23,870	1,341	25,211
Wyoming	895	22	917	3,566	56	3,622	2,366	11	2,377	5,932	67	5,999
District of Columbia		28	28		141	141		93	93		234	234
Puerto Rico				408	144	552	1,035	52	1,087	1,443	196	1,639
Total	35,505	5,112	[2] 40,617	240,875	24,602	265,477	587,659	13,705	601,364	828,534	38,307	866,841

[1] Alaska includes 346 miles of ferry routes.

[2] 383 miles within the 41,000-mile limitation are not assigned to routes, and are held in reserve for adjustments of route lengths as final locations are selected and projects built.

Table 19.—Status of national forest highway projects as of June 30, 1961, and projects completed during the fiscal year [1]

State or territory	Programed,[2] construction not yet authorized			Construction authorized, not started			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama							$392,700	$392,700	6.5			
Alaska	$3,067,000	$3,027,000	16.7	$433,700	$433,700	1.6	5,664,502	5,264,500	38.4	$1,472,869	$1,307,869	7.8
Arizona	1,100,000	1,100,000	15.3				3,374,192	3,374,192	84.4	983,328	983,328	43.6
Arkansas							2,526,230	1,263,105	45.2	880,210	440,105	15.6
California	4,250,000	4,250,000	24.8	2,320,395	2,320,395	43.0	5,943,600	5,943,600	33.2	3,134,806	3,064,806	18.7
Colorado	3,630,000	3,630,000	16.0	281,000	281,000	12.9	599,000	599,000	3.3	3,888,473	3,888,473	65.7
Connecticut												
Delaware												
Florida				86,400	86,400	.3						
Georgia										197,703	187,110	1.9
Hawaii												
Idaho	4,715,000	4,715,000	67.6	1,876,500	1,876,500	37.2	1,373,010	1,373,010	44.0	3,925,806	3,487,102	49.6
Illinois	180,000	89,994	1.8							71,615	35,807	.8
Indiana	53,000	53,000	.1							88,670	44,335	
Iowa												
Kansas												
Kentucky										220,684	220,684	5.2
Louisiana							151,120	75,560	3.2			
Maine												
Maryland												
Massachusetts												
Michigan	500,000	500,000	10.8	454,200	296,850	25.7				275,284	133,561	4.4
Minnesota	45,000	45,000	.3	444,732	435,446	13.7	229,912	229,912	7.5	909,186	890,989	19.2
Mississippi							606,347	606,347	9.9			
Missouri	306,480	306,480	22.2	120,239	120,239	4.7				99,980	99,980	9.3
Montana	3,830,000	3,830,000	81.5	193,000	193,000	2.2	2,601,000	2,601,000	41.3	2,402,583	2,402,583	68.2
Nebraska										103,105	103,105	3.1
Nevada	450,000	450,000	2.7	901,064	706,890	6.6				483,000	483,000	12.3
New Hampshire	190,000	190,000	5.0				282,309	282,309	7.1			
New Jersey												
New Mexico	300,000	300,000	3.8	1,450,000	1,450,000	37.9	400,000	400,000	4.9	1,178,401	1,178,401	21.8
New York												

North Carolina							312,580	156,290	4.5			
North Dakota							58,634	58,634	1.4			
Ohio							28,800	28,800		16,732	16,732	
Oklahoma	129,278	64,200	2.4									
Oregon	4,161,000	4,161,000	73.5	1,195,000	1,195,000	7.7	6,596,300	6,046,300	72.9	5,062,517	4,580,284	54.3
Pennsylvania				200,000	100,000	1.7				419,000	209,500	3.0
Rhode Island												
South Carolina	103,000	51,000	1.8				495,400	268,800	32.9	89,200	41,000	5.4
South Dakota	250,000	250,000	1.5	224,000	224,000	2.5				312,500	312,500	2.7
Tennessee				280,788	140,394	7.1	142,112	71,056	1.6			
Texas	204,500	204,500	17.6				235,600	117,800	4.5			
Utah	1,180,000	1,180,000	8.9	302,500	302,500	18.5	790,000	790,000	13.8	1,647,750	1,647,750	20.0
Vermont							114,723	114,723	1.7	75,601	75,301	.9
Virginia	328,450	328,450	6.5				428,002	304,809	8.1	36,735	36,735	1.7
Washington	2,284,500	2,034,500	21.2				2,830,000	2,830,000	17.0	2,368,277	2,368,277	16.5
West Virginia	95,000	95,000					507,400	507,400	10.6			
Wisconsin							615,880	615,880	12.2			
Wyoming	1,365,000	1,365,000	23.7	184,000	184,000	11.4	1,963,000	1,963,000	16.4	572,869	572,869	17.0
District of Columbia												
Puerto Rico				8,000	8,000							
Total	32,717,208	32,220,124	425.7	10,955,518	10,354,314	234.7	39,262,353	36,278,727	526.5	30,916,884	28,812,186	468.7

[1] Includes construction projects only.
[2] Initial commitment of funds.

Table 20.—Mileage of the national forest highway system, by forest road class and by State, as of June 30, 1961

Region and State or territory	Total	Class 1 [1]	Class 2 [2]	Class 3 [3]
WEST:				
Alaska	567.8	161.7	238.6	167.5
Arizona	1,051.7	327.5	653.0	71.2
California	2,451.7	1,066.4	827.5	557.8
Colorado	1,489.0	572.9	544.1	372.0
Idaho	1,229.2	659.6	452.6	117.0
Montana	1,236.1	678.3	257.4	300.4
Nevada	369.5	154.7	177.1	37.7
New Mexico	642.3	131.2	431.7	79.4
Oregon	1,473.5	681.5	729.3	62.7
South Dakota	300.2	187.1	101.1	12.0
Utah	732.1	224.2	270.8	237.1
Washington	766.8	480.5	238.4	47.9
Wyoming	562.4	344.4	135.5	82.5
Total	12,872.3	5,670.0	5,057.1	2,145.2
EAST:				
Alabama	374.4	82.3	276.8	15.3
Arkansas	633.3	96.7	536.6	
Florida	288.0	32.7	246.5	8.8
Georgia	381.3	168.5	187.0	25.8
Illinois	306.2	241.3	45.7	19.2
Indiana	101.2	53.6	47.6	
Iowa	20.0	11.3	8.3	0.4
Kentucky	351.4	131.1	211.2	9.1
Louisiana	402.1	53.3	171.6	177.2
Maine	14.0			14.0
Michigan	1,161.3	590.4	553.1	17.8
Minnesota	704.0	311.8	365.4	26.8
Mississippi	547.1	323.9	222.3	0.9
Missouri	976.2	370.7	599.3	6.2
Nebraska	23.5		23.5	
New Hampshire	159.3	61.9	41.0	56.4
North Carolina	830.0	358.0	430.7	41.3
Ohio	131.6	70.4	51.7	9.5
Oklahoma	81.8	45.1	36.7	
Pennsylvania	353.9	118.4	85.9	149.6
South Carolina	776.7	238.2	467.5	71.0
Tennessee	568.7	168.7	340.6	59.4
Texas	365.7	128.3	209.9	27.5
Vermont	119.1	32.7	61.9	24.5
Virginia	1,409.7	379.0	928.4	102.3
West Virginia	495.4	78.4	376.0	41.0
Wisconsin	467.5	75.7	391.8	
Puerto Rico	42.5		42.5	
Total	12,085.9	4,222.4	6,959.5	904.0
Grand total	24,958.2	9,892.4	12,016.6	3,049.2

[1] Forest roads which are on the Federal-aid primary system.
[2] Forest roads which are on the Federal-aid secondary system.
[3] Other forest highways.

For economy of space, table 21 is placed on page 101.

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